Pollution Prevention Equipment Book
PDF Edition

Content provided by Naval Air Warfare Center Lakehurst (NAWC Lakehurst) and Naval Facilities Engineering Service Center (NFESC)

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Equipment Vendors
The equipment described in the Pollution Prevention (P2) Equipment Book were procured under previously established contracts. The information presented is not intended as an endorsement of any single vendor's product. Vendors listed under Preproduction Initiative-NELP were selected for one-time prototype studies to determine the ability of a "type of equipment" to meet the Navy's P2 needs. Vendors listed under a competitive initiative won competitive procurement contracts to supply their make/model of equipment to the Navy. Subsequent contracts will be recompeted and may or may not result in the selection of the same vendor.

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Cost Analysis Data
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INTRODUCTION

U.S. Navy Pollution Prevention Equipment Program

The U.S. Navy has adopted a proactive and progressive position toward protecting the environment and complying with environmental laws and regulations. Rather than merely controlling and treating hazardous waste by end-of-the-pipe measures, the Navy has instituted a program for Pollution Prevention (P2) to reduce or eliminate the volume and toxicity of waste, air emissions, and effluent discharges.

P2 allows the Navy to meet or exceed current and future regulatory mandates and to achieve Navy-established goals for reducing overall hazardous waste generation and toxic chemical usage. P2 measures are implemented in a manner that maintains Navy readiness. An additional benefit has been a general increase in operational efficiency.

The Navy has truly set the standard for the procurement and implementation of P2 equipment. The Chief of Naval Operations (CNO), Environmental Protection, Safety, and Occupational Health Division (N45), established the P2 Equipment Program, through which both the Naval Air Warfare Center Lakehurst (NAWCADLKE) and the Naval Facilities Engineering Service Center (NFESC) serve as procurement agents under the direction of (N45). P2 equipment is specified and procured under two complementary initiatives, the Preproduction Initiative (*i.e.*, technology demonstration) and the Competitive Procurement Initiative. The Preproduction Initiative directly supports both the Navy Environmental Leadership Program (NELP) for P2 shore applications and the P2 Afloat Program, which prototypes and procures P2 equipment specific to the needs of ships.

Preproduction Initiative

NELP. Technology demonstrations and evaluations are primarily performed under NELP at two designated NELP sites—Naval Air Station North Island in San Diego, California and Naval Station Mayport in Mayport, Florida. Additional sites have been added as required to meet mission goals. The program involves defining requirements, performing site surveys, procuring and installing equipment, training operators, and collecting data during an operational test period. The equipment is assessed for environmental benefits, labor and cost savings, and its ability to interface with site operations.

P2 Afloat. Under this initiative, a representative ship is selected for each class of Navy vessel. Site surveys are performed aboard each ship, and P2 opportunities are developed. P2 equipment technologies specific to shipboard requirements are then demonstrated—yielding cost and effectiveness data. Successful prototype demonstrations may later be transitioned to the remainder of ships by class.

Competitive Procurement Initiative

After reviewing performance and the benefits of the prototype equipment procured under NELP, recommendations are made for fleet-wide implementation. The Competitive Procurement Initiative manages and accomplishes bulk buys of these items as well as other established P2 equipment. In addition, P2 equipment is procured on a "special need" basis to accommodate individual Navy activity requirements.

P2 Equipment Documents PDF Edition

The P2 Equipment PDF Edition contains summaries of the Preproduction and Competitive Procurement efforts. The summaries include detailed information that allow users to identify pieces of P2 equipment that could potentially benefit their activity and resolve challenging compliance issues. For each piece of P2 equipment, the following information is presented in the form of a *General Description.*

- P2 Opportunity—an opportunity whereby the application of a P2 technology would reduce or eliminate a pollution media.
- Equipment Description—leading technical characteristics
- Implementation Requirements—site preparation and compatibility specifications
- Benefits—environmental, health, safety, and cost advantages
- Other Information—key issues and authorization matters
- Procuring Activity Manager and Technical Activity POC—persons to consult for further information
- Vendor—name(s) of vendors (Note: The information provided is not meant as an endorsement of any single vendor or type of equipment. It simply lists those vendors that have been selected as a result of prototype studies or established competitive contracts.)
- Cost—In the case of a Preproduction Initiative, the cost designates the number of units purchased, which is shown in parentheses. Preproduction costs include the cost of the unit(s), training, and basic start-up consumables required to use the unit(s), if applicable. Installation and site preparation costs are not included unless they are actual line items in the contract established with the vendor, as in the case of a turnkey system. If installation or site preparation costs are included in the total cost, they will be indicated in parentheses. In the case of a Competitive Initiative, cost is reported solely on a per unit basis. If start-up consumables are included, they will be indicated.

Additional documents are characteristic of the type of initiative under which the piece of equipment was procured. Not all pieces of equipment have each type of document. Therefore, the Table of Contents lists each piece of equipment followed by two letter codes (listed below) that indicate which type of document will be found for that piece of equipment. For example, equipment under the Preproduction Initiative-NELP that has a general description, a cost analysis, and test plan will be followed by the codes GD, CA, TP. P2 Afloat information will be included in the next update of the PDF Edition.

Preproduction Initiative-NELP Documents

- General Description (GD)
- Cost Analysis (CA)—summary of data collected and return on investment
- Test Plan (TP)—used by the site to collect data regarding the unit effectiveness and ability to prevent pollution
- Final Report (FR)—narrative overview of the unit success and site experience

Competitive Initiative Documents

- General Description (GD)
- Technical Specification (TS)—thorough description of the unit features

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DISCLAIMERS

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PREPRODUCTION INITIATIVE-NELP
55-GALLON DRUM CRUSHER
GENERAL DESCRIPTION

P2 Opportunity: Reduce the volume of solid waste to be disposed of by compacting 55-gallon drums. Facilitate handling and storage of drums until they are disposed of or recycled.

Equipment Description: The 55-gallon drum crusher unit uses a single-lever hydraulic control to crush drums down to 7" pancakes. The unit also has in-drum compaction capabilities.

Implementation Requirements:

- Foundation: Concrete slab recommended.
- Size: 1,600 lbs
- Weather Protection: Overhang is recommended if unit is to be placed outside.
- Electric: 208V, 3 phase

Benefits:

- Reduce labor for drum handling operations.
- Reduce volume of solid waste.
- Reduce waste disposal costs.

Other Information: If the crushed drums are to be recycled, a local recycler and acceptance criteria must be identified. Applicable solid and hazardous waste regulations may require research to define “empty drums.” Drums to be crushed may need to be monitored to ensure the acceptance criteria are met for cleanliness, previous use, and residues.

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Technical Activity POC:	Walter Koehler, 4.8.1.4	Tel: (908) 323-7907
Vendor(s):	S&G Enterprises, Inc.	Model: 55SC
FY/Site(s):	1994 NELP Initiative, NS Mayport	
Cost:	$10,029 (1 unit)	

PREPRODUCTION INITIATIVE-NELP
55-GALLON DRUM CRUSHER
COST ANALYSIS

PROTOTYPE SITE: NS Mayport

DESCRIPTION: Crushes drums to 7" pancakes, thereby reducing the volume of solid waste generated.

DATA COLLECTION PERIOD: October 1995 - August 1996

COST SAVINGS: This unit will significantly reduce waste volume. The cost of collection, transport, and disposal of these drums is proportional to the volume of waste. Uncrushed drums take up more space and require more labor hours to handle. Either a larger truck or more frequent trips are required to collect and transport uncrushed drums. Landfill disposal costs are greater for uncrushed drums. A 20-yard dumpster can hold approximately 300 crushed drums but fewer than 50 uncrushed drums. The drum crushing unit crushes drums to approximately 1/5 the original size, an 80% reduction in volume.

PREVIOUS METHOD: Removal of Uncrushed Drums from Site

No significant costs have been reported under this process. The activity brings the empty drums to the DRMO, where a contractor picks them up and transports them off-site at no cost.

NELP METHOD: Drum Crusher

Waste Disposal

Contractor disposal cost per dumpster (300 drums): $308.00
Number of dumpsters per year: 6 (1,800 drums)
Cost per year: $1,848.00

Labor

Cycle time of unit per drum: 1.5 minutes
E-3 labor rate per hour: $10.39
Drums per year: 1,800
Labor hours per year: 45
Cost per year: $467.55

Total Annual Costs

Item	Cost
Waste Disposal	$1,848.00
Labor	467.55
Total	$2,315.55

COST ANALYSIS SUMMARY (PER YEAR)

Removal of Uncrushed Drums	Insignificant*
Removal of Crushed Drums	$2,315.55
Initial Procurement	$8,275.00
Expected Service Life	10 years
% Volume Reduction	80

*The major benefit provided by this technology is to the environment. An 80% reduction in waste volume being added to overcrowded landfills is a significant achievement.

PREPRODUCTION INITIATIVE-NELP
55-GALLON DRUM CRUSHER
TEST PLAN

1.0 OBJECTIVE

The objective of this test plan is to describe the process data collection procedure for the 55-gallon drum crusher unit. The data will be used to determine the efficiency, effectiveness, and overall success of the unit in crushing 55-gallon drums and 5-gallon pails, as well as to assess the ability of the unit to interface successfully with site operations.

2.0 DESCRIPTION

Currently, the empty 55-gallon drums on-site are not being crushed. They accumulate rapidly, occupy large amounts of space, and are difficult to handle. The 55-gallon drum crusher produces 7" pancakes, which take up less space and are easier for personnel to handle and transport. In addition, 5-gallon pails may be crushed within a 55-gallon drum using the unit’s in-drum compaction capabilities.

Only drums and pails that have been drained of their contents (through the two holes in the top and bottom of the drum) will be accepted. Of the drums to be crushed, 80% originally contained oil; 19% previously contained cleaning solvent/fluids or aqueous film forming foam (AFFF); and the remaining 1% is comprised of various other substances. The previous contents of the empty 5-gallon pails are also varied.

It is expected that the site will crush approximately 25 drums per week (or 100 drums per month). There is currently an accumulated volume of 500 to 600 55-gallon drums. The crushed drums and pails will be deposited in a dumpster on-site. A contractor on the base will manage the crushed waste, which will be taken to a landfill.

3.0 TEST PLAN

This test plan will be used to evaluate the effectiveness of the drum crushing method in reducing volume and facilitating the handling of the 55-gallon drums.

3.1 Approach

Quantitative and qualitative data will be acquired by completion of Table 1.

3.1.1 Instructions for Completing Table 1

- **Date:** Indicate dates the drum crusher was used (month and day).
- **Quantity:** Indicate the total quantity, or volume, of 55-gallon drums crushed on a given date.

- **Time/Task:** Record the time per unit task, (*i.e*., length of time required to load, crush, and unload each 55-gallon drum).

- **Drum/Pail Residue:** List original contents if drum or pail effluent or residue leaked from the unit on completion of a particular crushing task.

- **Downtime/Month**

  – **Time Period:** Record time periods when the unit is not in use

  – **Reason:** Explain whether downtime was due to repairs, maintenance problems, workload, or other factors.

- **Repair Time:** Indicate time required for repairs.

- **Repair Parts Required:** List repair parts required and cost.

- **Qualitative Assessment:** Provide a narrative evaluation of the unit's performance. Briefly discusses:

  – Efficiency of the method (*e.g.,* time and cost savings)

  – Ease of use and the unit's ability to successfully interface with site operations.

4.0 REPORTING

The data entry form is a concise method of data collection. The form should be completed on a daily basis. Data will be collected for 1 year. During this time, periodic status reports on the testing will be submitted to NAWCADLKE. The final report will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations.

Table 1

Date	Quantity	Time/Task	Drum/Pail Residue	Downtime/Month		Repair Time	Repair Parts Required
				Time Period	Reason		

Qualitative Assessment*:
Please comment on the effectiveness and efficiency of the unit.

____

____

____

____

*Attach extra sheet if required.

PREPRODUCTION INITIATIVE-NELP
55-GALLON DRUM CRUSHER
FINAL REPORT

NS MAYPORT, FL

1.0 INTRODUCTION

The U.S. Navy has adopted a proactive and progressive position toward protecting the environment and complying with environmental laws and regulations. Rather than merely controlling and treating hazardous waste by end-of-the-pipe measures, the Navy has instituted a program for Pollution Prevention (P2) to reduce or eliminate the volume and toxicity of waste, air emissions, and effluent discharges.

P2 allows the Navy to meet or exceed current and future regulatory mandates and to achieve Navy-established goals for reducing hazardous waste generation and toxic chemical usage. P2 measures are implemented in a manner that maintains Navy readiness. An additional benefit has been a general increase in operational efficiency.

The Navy has truly set the standard for the procurement and implementation of P2 equipment. The Chief of Naval Operations (CNO), Environmental Protection, Safety, and Occupational Health Division (N45), established the P2 Equipment Program, through which both the Naval Air Warfare Center Lakehurst (NAWCADLKE) and the Naval Facilities Engineering Service Center (NFESC) serve as procurement agents under the direction of (N45). P2 equipment is specified and procured under two complementary initiatives, the Preproduction Initiative (*i.e.*, technology demonstration) and the Competitive Procurement Initiative. The Preproduction Initiative directly supports both the Navy Environmental Leadership Program (NELP) for P2 shore applications and the P2 Afloat program, which prototypes and procures P2 equipment specific to the needs of ships.

This report provides an analysis of the procurement, installation, and operation of P2 equipment under the Preproduction Initiative. Technology demonstrations and evaluation were primarily performed under NELP at two designated NELP sites, NAS North Island and NS Mayport. Additional sites have been added as required to meet mission goals. The program involves defining requirements, performing site surveys, procuring and installing equipment, training operators, and collecting data during an operational test period. The equipment is assessed for environmental benefits, labor and costs savings, and ability to interface with site operations.

2.0 BACKGROUND

Before implementation of the 55-gallon drum crusher, NS Mayport collected empty drums from various sources on the base. These empty drums were reused by the Hazardous Waste section, used as trash cans or soda can receptacles in the recycling center, or sent to DRMO where a contractor removed them at no charge and sold them as scrap metal. The advantage of drum crushing is environmental—there is an 80% reduction in solid waste to be landfilled as well as more efficient transport of drums because of the decrease in volume.

The P2 goal was to reduce the volume of solid waste to be disposed of by compacting 55-gallon drums. This facilitates handling and storage of drums until they are shipped off-site for either disposal or recycling by scrap metal contractors.

A vendor search revealed that the Model 55SC drum crusher manufactured by S&G Enterprises was the best overall choice for this application.

3.0 P2 EQUIPMENT DESCRIPTION

3.1 Specifications

The 55-gallon drum crusher unit uses a single-lever hydraulic control to crush drums into 7" pancakes. The unit weighs 1,600 lbs and also has in-drum compaction capabilities.

3.2 Implementation Requirements

- Foundation: Concrete slab recommended
- Weather protection: Overhang recommended if unit is placed outside
- Electric: 208V, 3 phase

3.3 Benefits

- Reduce labor for drum handling operations.
- Reduce volume of solid waste.
- Reduce waste disposal costs.

4.0 DATA ANALYSIS

Data was collected from November 1995 through August 1996 according to the Operational Test Plan.

4.1 Quantitative Analysis

The drum crusher costs $1,848 with annual waste disposal and labor costs totaling $467.55. See Cost Analysis for the full data.

4.2 Qualitative Analysis

4.2.1 Installation

There were delays attaining operational status because of internal decisions on base that changed the site originally surveyed to a different location. After the unit arrived on base, new sites were considered, and HazMat Building 1854 was finally selected. Because the site was not prepared to receive the unit, further delays were incurred while electrical hook-up was readied. The site then needed to procure a dumpster to contain the crushed drums.

4.2.2 Training

A 1-day training course was arranged for July 5, 1995. A representative of Extratec inspected the installation and provided start-up and operator training. Ten personnel were present during the start-up, operation, and safety review. Performance expectations were reviewed in detail.

4.2.3 Maintainability

The 55-gallon drum crusher works well and has experienced few problems since operation began. Because the unit was transferred between sites before becoming operational, it was not always properly protected from the weather. As a result, corrosion was evident when finally situated at the present site. Approximately 7 months after the unit became operational, there was a minor oil leak from the hydraulic system, and a shut down occurred. With the use of a repair kit and the installation of a new o-ring, the unit resumed function.

It was noted on the data collection forms that, in the case of new drums, the crushing cycle must be performed twice. If new drums are commonly crushed, this may necessitate a more rugged model.

4.2.4 Interface with Site Operations

The drum crusher required little change in site operations. Once installed, the drum crusher was idle while the site waited for the delivery of a dumpster to contain the crushed drums. Beyond this start-up issue, the unit provided a useful service to the activity and the DRMO in accomplishing waste volume reduction goals.

4.2.5 Overall Performance

The site is very pleased with the performance of the drum crusher. The unit provides ease of handling, transport and disposal of drums and solid waste volume reduction. In fact, several other sites have requested that a drum crusher be purchased for them.

5.0 LESSONS LEARNED

The drum crusher unit reduced volume as proposed in the test plan. However, the overall environmental benefit of this machine could be enhanced by using the drum crusher in concert with a drum rinser so that drums could then be recycled. Recycling yields even further waste reduction as well as increased cost savings.

For future implementation at different sites, it may be beneficial to install the drum crusher unit at the DRMO—a central location for materials such as used drums. All drums would then pass through the same treatment and handling, as opposed to locating the unit at a specific activity. This can help keep base activities consistent with regard to used drums.

A more rugged unit is planned for competitive procurements. This should reduce labor time to “recrush” sturdy new drums and additional wear on the unit.

6.0 CONCLUSIONS

The drum crusher achieved the goal of waste volume reduction by crushing drums to 1/5 their original size. The success of this prototype lies in the environmental benefit of this waste volume reduction. If the drums must go to a landfill, they are already compacted in size. If a local recycler will accept them, they are more easily transportable.

Based on current disposal practices and site-specific drum handling options available, some sites may achieve greater financial savings from the use of a drum crusher than the prototype site. Some economic benefits are site-dependent based on availability and acceptance criteria of local recyclers. However, all sites can benefit from the volume-dependent cost associated with drum handling, such as the collection, transport, and disposal of used drums. Fewer truckloads to carry the same number of drums and lower landfill fees are representative of the savings to be had.

PREPRODUCTION INITIATIVE-NELP
AQUEOUS PARTS WASHER (LARGE)
GENERAL DESCRIPTION

P2 Opportunity: Use non-hazardous, biodegradable aqueous detergent in a closed-loop parts cleaning system as a substitute for 1,1,1 trichloroethane in cleaning operations. Replace ultrasonic cleaners, vapor degreasers, and solvent tanks at the I-level.

Equipment Description: Aqueous parts washers are cleaning cabinets with spray nozzles positioned along the interior walls and ceiling that direct a heated, high-pressure stream of water and detergent at parts to be cleaned. The combination of high temperature and high blasting pressure removes dirt, grime, oil, grease, and fluorescent penetrants.

Implementation Requirements:

- Electric: 240V, 3 phase (with purifier filtration system)
- Water: Standard building gpm flow rate
- Ventilation: Not required but recommended for low-ceiling or confined locations

Benefits:

- Reduce labor time to clean parts—25% compared with Safety Kleen tank and 50% compared with P-D-680 tanks.
- Replace hazardous solvents with a biodegradable detergent.
- Reduce disposal costs of hazardous waste.
- Provide a healthier work environment.
- Reduce quantity and toxicity of waste stream—45% compared with P-D-680 tanks and 27% compared with Safety Kleen tanks.

Other Information: Sludge must be periodically removed from unit sludge trap and disposed of as solid waste. Authorization may be required to clean certain parts using this method.

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Vendor(s): Better Engineering Manufacturing, Inc. Model: F-4000-P

FY/Site(s): 1994 NELP Initiative, NAS North Island, NS Mayport

Cost: $40,302 (3 units)

PREPRODUCTION INITIATIVE-NELP
AQUEOUS PARTS WASHER (LARGE)
COST ANALYSIS

PROTOTYPE SITES: NAS North Island, NS Mayport

DESCRIPTION: Cleans parts using a biodegradable aqueous solution in a closed-loop system with spray nozzles located along the interior walls and ceiling to direct the cleaning solution. High temperatures and blasting pressure combine to remove dirt and grease from parts without the use of 1,1,1 trichloroethane or other ozone-depleting cleaning solvents.

DATA COLLECTION PERIOD: July 1995 - February 1996

COST SAVINGS: The site previously used a Safety Kleen immersion tank for parts washing, which required hand brushing and soaking parts in solvent. The waste solvent is disposed of as hazardous waste under contract with Safety Kleen, which provides a service schedule for the collection and disposal of waste solvent. Many other sites use a P-D-680 dip tank; therefore, a cost comparison is provided for this method as well.

PREVIOUS METHOD: Safety Kleen Tank

The service schedule specified for the Safety Kleen Model 34 parts cleaner is 4 weeks, at a rental cost of $144.37 per month. A service representative drains the spent Safety Kleen solvent, refills with fresh solvent, and disposes of the used solvent. Model 34 has a 30-gallon tank capacity. The site has stated that cleaning parts using the Safety Kleen system takes approximately the same amount of time as the aqueous parts washer. However, the operator can perform other tasks while parts are being cleaned in the aqueous parts washer, which is not possible with the Safety Kleen tank.

Service

Cost per month: $144.37
Cost per year: $1,732.44

Labor

E-3 labor rate per hour: $10.39
Time per part: 20 minutes
Throughput per week: 50 parts
Throughput per year: 2,600 parts
Cost per year: $9,004.67

Waste Disposal

Thirty (30) gallons of waste are generated per month. Waste disposal costs are included in the Safety Kleen contract for a monthly service fee of $144.37 per Safety Kleen unit.

Total Annual Costs

Item	**Cost**
Service	$1,732.44
Labor	9,004.67
Waste Disposal	N/A
Total	$10,737.11

PREVIOUS METHOD: P-D-680 Tank

The P-D-680 tank is similar to the Safety Kleen tank but utilizes the non-proprietary solvent P-D-680.

Consumables

Solvent: P-D-680 Type II
Cost per month: $440.00
Cost per year: $5,280.00

Labor

E-3 labor rate per hour: $10.39
Time per part: 30 minutes
Throughput per week: 50 parts
Throughput per year: 2,600 parts
Cost per year: $13,507.00

Waste Disposal

Item disposed of: Spent P-D-680 Type II solvent mixture
Cost per month: $300.00
Cost per year: $3,600.00

Total Annual Costs

Item	Cost
Consumables	$5,280.00
Labor	13,507.00
Waste Disposal	3,600.00
Total	$22,387.00

NELP METHOD: Aqueous Parts Washer Unit (Model 300-P and Model 200)

Consumables

Item: Daraclean 282 detergent
Cost per gallon: $17.25
Cost per month (5 gallons): $86.25
Cost per year: $1,035.00

Item: Better Engineering Defoamer (NAT-DF)
Cost per year: $44.85

Labor

E-3 labor rate per hour: $10.39
Time per part: 15 minutes
Throughput per week: 50 parts
Throughput per year: 2,600 parts
Cost per year: $6,753.50

Waste Disposal

Amount of sludge to be disposed of per 3-week period: 250 cc
Cost per 3-week period: $29.00
Cost per year: $505.00
Cost per one 55-gallon drum of hazardous waste: $21.30

Aqueous solution (75 gallons) is replaced once every 6 months. It has generally been found to be nonhazardous. If the solution *is* hazardous, the yearly waste disposal cost would be as shown below. This figure includes the disposal of four 55-gallon drums of waste per year, which would be used for disposal of the 150 gallons of solution as well as the cost of the sludge above.

Yearly waste disposal cost:
$9.70 sludge/week x 52 weeks/year + [($21.30 x 2 drums) x 2 times/year] = $590.00

Total Annual Costs

Item	**Cost**
Consumables	$1,079.85
Labor	6,753.50
Waste Disposal	590.00
Total	$8,423.35

COST ANALYSIS SUMMARY (PER YEAR): MODEL 300-P

Safety Kleen	$10,737.11
Aqueous Parts Washer	$8,423.35
Cost Change	$2,313.76
Initial Procurement	$13,434.10
Expected Service Life	10 years
Return on Investment (per 10-year period)	$9,703.50 per unit [10 x $10,737.11] - ($13,434.10 + (10 x $8,423.35)]
Break Even	5.81 years [$13,434.10/$2,313.76]

P-D-680	$22,387.00
Aqueous Parts Washer	$8,423.35
Cost Change	$13,963.65
Initial Procurement	$13,434.10
Expected Service Life	10 years
Return on Investment (per 10-year period)	$126,202.40 per unit [10 x $22,387.00] - ($13,434.10 + (10 x $8,423.35)]
Break Even	0.96 years [$13,434.10/$13,963.65]

COST ANALYSIS SUMMARY (PER YEAR) - MODEL 200

Safety Kleen	$10,737.11
Aqueous Parts Washer	$8,423.35
Cost Change	$2,313.76
Initial Procurement	$8,747.60
Expected Service Life	10 years
Return on Investment (per 10-year period)	$14,390.00 per unit [10 x $10,737.11] - ($8,747.60 + (10 x $8,423.35)]
Break Even	3.78 years [$8,747.60/$2,313.76]
P-D-680	$22,387.00
Aqueous Parts Washer	$8,423.35
Cost Change	$13,963.65
Initial Procurement	$8,474.60
Expected Service Life	10 years
Return on Investment (per 10-year period)	$130,888.90 per unit [10 x $22,387.00] - ($8,747.60 + (10 x $8,423.35)]
Break Even	0.63 years [$8,747.60/$13,963.65]

Two items need to be mentioned that have not been taken into account in this analysis. First, cost and labor hour savings can be realized by cleaning several parts simultaneously in the aqueous parts washer. One aqueous parts washer can do the work of three Safety Kleen units. Many activities are currently using aqueous parts washers to do the work of several chemical solvent units.

The aqueous parts washer provides the following process improvements over the existing method (Safety-Kleen tanks).

- Although the labor hours appear to be the same for the two methods, they double for each additional component cleaned in the Safety Kleen tanks. However, because the aqueous parts washer can clean multiple parts, there is no increase in labor hours.

- Three Safety Kleen tanks would have to be procured to match the maximum utility of one aqueous parts washer.

Data gathered for this analysis are compiled from military activities included in the LMTCE Jacksonville report “High Pressure Spray Parts Washers: I-level Prototype Study,” dated 3 March 1994; “Environmental Compliance Cook Book,” based on pollution prevention equipment aboard the USS THEODORE ROOSEVELT; “Pollution Prevention Study for PWC-T NAS Mayport” prepared by Pacific Environmental Services; Utah National Guard “Hazardous Waste Minimization and Pollution Prevention Leadership Demonstration Project of 21 May 1992”; data from the TECHEVAL of the aqueous parts washer currently being evaluated at NAWCAD Patuxent River, MD; and data from the East Coast NELP site, NS Mayport, FL.

PREPRODUCTION INITIATIVE-NELP
AQUEOUS PARTS WASHER (LARGE)
TEST PLAN

1.0 OBJECTIVE

This test plan describes the process data collection procedure for the aqueous parts washers. The data will be used to determine the systems' efficiency, effectiveness, overall performance, and ability to interface successfully with site operations. Recommendations for fleetwide purchase will be based on your input.

2.0 DESCRIPTION

Currently, AIMD Airframe parts are cleaned in a P-D-680 dip tank. These parts include aircraft tires (rims) and panels, which are manually scrubbed using P-D-680—a known health hazard. The closed-loop aqueous parts washing system will eliminate consumption of this hazardous solvent and reduce labor hours and frequency of solvent disposal—saving both time and money.

3.0 TEST PLAN

This test plan will be used to evaluate the effectiveness of the aqueous parts washer units compared to current manual washing methods.

3.1 Approach

Quantitative and qualitative data will be acquired by completion of Tables 1 and 2.

3.1.1 Instructions for Completing Table 1

- **Date:** Indicate dates the aqueous parts washer unit was used (month and day).
- **Item Use**
  - **Parts Washed:** List parts washed for each date entered.
  - **Quantity:** Indicate the quantity or volume of parts washed for each date entered.
  - **Frequency:** Indicate the frequency of usage on a given date (*e.g.*, 1, 2, 3 times).
- **Quantity Consumables Used:** Indicate the quantity or volume of consumables (*e.g.*, detergent and defoamer) added to the unit for each date entered.

- **Time/Task:** Indicate the time required to complete each task (*e.g.*, the cycle time per batch of parts).

- **Downtime/Month**

  – **Time Period:** Record time periods when the unit is not in use.

  – **Reason:** Explain whether downtime was due to repairs, maintenance, workload, or other factors.

- **Repair Time:** Indicate time required to repair the unit.

- **Repair Parts Required and Cost:** List repair parts required and cost.

- **Consumables Ordered:** Record dates consumables were ordered as well as the type, quantity, and cost.

- **Qualitative Assessment:** Provide a narrative evaluation of the cleaning abilities of the aqueous parts washer unit. Briefly discuss:

  – Efficiency of this method (*e.g.*, time and cost savings)

  – Ease of use and the unit's ability to successfully interface with site parts cleaning operations

  – Overall satisfaction with the cleanliness of the parts (compared to parts washed by previous methods)

  – State method of determining cleanliness, as well as any additional cleaning required after wash.

3.1.2 Instructions for Completing Table 2

- **Date:** Indicate dates the aqueous parts washer was used (month and day).

- **Operating Water Temperature:** Indicate water temperature at which the unit was used for each day recorded.

- **Operating Water Pressure**: Indicate water pressure at which the unit was used for each day recorded.

- **Contaminants Removed:** List contaminants removed through entrapment in filter, sludge collection, and dissolution in wastewater.

- **Flash Rust of Steel Parts:** Based on visual observation, indicate "yes" or "no" if there is evidence of flash rust of steel parts. If "yes," list the specific parts that experienced flash rust in the Qualitative Assessment section.

- **Water Pressure Damage:** Based on visual observation, indicate "yes" or "no" if parts were damaged due to water pressure. If "yes," list the specific parts that experienced water pressure damage in the Qualitative Assessment section.

- **Detergent Retention:** Based on visual observation, indicate "yes" or "no" if there is evidence of detergent retention on washed parts. If "yes," list the specific parts that had evidence of detergent retention in the Qualitative Assessment section.

- **Water Entrapment in Parts:** Based on visual observation, indicate "yes" or "no" if parts were damaged due to water entrapment. If "yes," list the specific parts that experienced water entrapment in the Qualitative Assessment section.

- **Solution Foaming:** Based on visual observation, indicate "yes" or "no." Record any further comments in the Qualitative Assessment section.

- **Interior Corrosion of Unit:** Based on visual observation, indicate "yes" or "no." Record any further comments in the Qualitative Assessment section; note the exact location of the corrosion.

- **Qualitative Assessment:** Include specific details on any of the above sections marked "yes."

4.0 REPORTING

The data entry forms are a concise method of data collection. Forms should be completed on a daily basis. Data will be collected for 1 year. During this time, periodic status reports on the testing will be submitted to NAWCADLKE. The final report will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations.

Table 1

Date	Item Use			Quantity Consumables Used	Time/Task	Downtime/Month		Repair Time	Repair Parts Required and Cost
	Parts Washed	Quantity	Frequency			Time Period	Reason		

Consumables Ordered

Date	Type	Quantity	Cost

Qualitative Assessment*:
Please comment on the effectiveness and efficiency of the unit.

____

____

____

____

*Attach extra sheet if required

Table 2

Date	Operating Water Temperature	Operating Water Pressure	Contaminants Removed	Flash Rust of Steel Parts	Water Pressure Damage	Detergent Retention	Water Entrapment in Parts	Solution Foaming	Interior Corrosion of Unit

Qualitative Assessment*:
Provide details on any questions answered "yes."

____

____

____

____

*Attach extra sheets if required.

PREPRODUCTION INITIATIVE-NELP
AQUEOUS PARTS WASHER (LARGE)
FINAL REPORT

NS MAYPORT, FL AND NAS NORTH ISLAND, CA

1.0 INTRODUCTION

The U.S. Navy has adopted a proactive and progressive position toward protecting the environment and complying with environmental laws and regulations. Rather than merely controlling and treating hazardous waste by end-of-the-pipe measures, the Navy has instituted a program for Pollution Prevention (P2) to reduce or eliminate the volume and toxicity of waste, air emissions, and effluent discharges.

P2 allows the Navy to meet or exceed current and future regulatory mandates and to achieve Navy-established goals for reducing hazardous waste generation and toxic chemical usage. P2 measures are implemented in a manner that maintains Navy readiness. An additional benefit has been a general increase in operational efficiency.

The Navy has truly set the standard for the procurement and implementation of P2 equipment. The Chief of Naval Operations (CNO), Environmental Protection, Safety, and Occupational Health Division (N45), established the P2 Equipment Program, through which both the Naval Air Warfare Center Lakehurst (NAWCADLKE) and the Naval Facilities Engineering Service Center (NFESC) serve as procurement agents under the direction of (N45). P2 equipment is specified and procured under two complementary initiatives, the Preproduction Initiative (*i.e.,* technology demonstration) and the Competitive Procurement Initiative. The Preproduction Initiative directly supports both the Navy Environmental Leadership Program (NELP) for P2 shore applications and the P2 Afloat program, which prototypes and procures P2 equipment specific to the needs of ships.

This report provides an analysis of the procurement, installation, and operation of P2 equipment under the Preproduction Initiative. Technology demonstrations and evaluation were primarily performed under NELP at two designated NELP sites, NAS North Island and NS Mayport. Additional sites have been added as required to meet mission goals. The program involves defining requirements, performing site surveys, procuring and installing equipment, training operators, and collecting data during an operational test period. The equipment is assessed for environmental benefits, labor and costs savings, and ability to interface with site operations.

2.0 BACKGROUND

OPNAVINST 5090.1B bans the use of vapor degreasers at Aircraft Intermediate Maintenance Departments (AIMDs) and solvent cleaners that use 1,1,1 trichloroethane. Therefore, the primary P2 goal for this program is to implement an environmentally sound method for cleaning parts and components to replace the use of P-D-680 dip tanks and

Safety-Kleen units. Secondary goals include reducing the quantity and toxicity of the wastestream, reducing labor time, and providing a safer work environment. Surveys demonstrated that the two prototype sites, NAS North Island and NS Mayport, benefited from the use of an automated, closed-loop parts washer unit that operates independently, thereby allowing the operator to complete other tasks during the cycle time.

Both the Lead Maintenance Technology Center for the Environment (LMTCE) at NAS Jacksonville and the USS THEODORE ROOSEVELT evaluated parts washers in terms of overall effectiveness and features necessary to achieve a minimal acceptable level of cleaning. Aqueous parts washers manufactured by Better Engineering were identified as having the best overall performance among commercially available units. Options for the NELP test units were chosen in accordance with the guidelines provided by LMTCE Jacksonville and the recommendations provided by the "Environmental Cookbook" developed by the USS THEODORE ROOSEVELT. Detergents were chosen based on investigation of the qualified products list for MIL-C-29602 and consultation with NADEP Cherry Point personnel who have performed extensive comparisons of detergent performance in aqueous parts washers.

3.0 EQUIPMENT DESCRIPTION

The aqueous parts washer cleans parts using a biodegradable aqueous solution in a closed-loop system with spray nozzles located along the interior walls and ceiling to direct the cleaning solution. High temperature and blasting pressure combine to remove dirt and grease from parts without the use of 1,1,1 trichloroethane or other ozone-depleting cleaning solvents.

3.1 Specifications

The dimensions, tank size, turntable weight capacity, turntable area, and pump descriptions are:

Unit	Dimensions (W x D x H) (Inches)	Tank Size (Gallons)	Turntable Weight Capacity (Pounds)	Turntable Area (in^2)	Pump		
					hp	Flow	psi Output
Model 200	42 x 47 x 68.5	75	500	572	2	50	40
Model 300-P	57 x 59 x 72	100	1,000	1,075	5	100	60

3.2 Implementation Requirements

- Electric: Model 200: 240V, 1 phase, 60 Hz, 51A; Model 300-P: 240V, 3 phase, 60 Hz, 59A
- Water: Standard building gpm flow rate
- Ventilation: Not required but recommended for low-ceiling or confined locations (6" steam exhaust vent provided)

Model 300-P is equipped with a purification filtration system; both units are equipped with a portable titration unit for testing the solution concentration.

3.3 Benefits

- Reduce labor time to clean parts: 25% compared with Safety Kleen tanks and 50% compared with P-D-680 tanks.
- Replace hazardous solvents with a biodegradable detergent, thus reducing toxicity in wastestream.
- Reduce disposal costs of hazardous waste.
- Provide a healthier work environment.
- Reduce quantity of wastestream.

4.0 DATA ANALYSIS

Data was collected monthly from July 1995 to February 1996 based on the Operational Test Plan.

4.1 Quantitative Analysis

4.1.1 Aqueous Parts Washer vs. P-D-680 Dip Tanks

Unit	Return on Investment (per 10-Year Period)	Break-Even Point (Years)
Model 200	$130,888.90	0.63
Model 300-P	$126,202.40	0.96

4.1.2 Aqueous Parts Washer vs. Safety Kleen Unit

Unit	Return on Investment (per 10-Year Period)	Break-Even Point (Years)
Model 200	$14,390.00	3.78
Model 300-P	$9,703.50	5.81

See the Cost Analysis for a complete cost data.

4.2 Qualitative Analysis

4.2.1 Installation

Site preparation is minimal. Implementation requirements are provided in Section 3.0, Equipment Description.

4.2.2 Training

A 1-day training session was conducted to train all operators on operation, safety features, and maintenance of the units. A complete installation, operation, and maintenance manual is shipped with each unit.

4.2.3 Maintainability

Using these units according to the manufacturer's instructions will decrease the amount of maintenance required. The parts washers clean the majority of support equipment components satisfactorily. However, baked-on dirt and carbon are not typically removed in the first cycle; these parts must be manually cleaned.

Three detergents were used during the operational test period. Each was selected based on information from NADEP Cherry Point and the parts washer vendor. Natural Orange Liquid was supplied with the units. The units experienced internal rusting. It was later determined that this initial batch of detergent was at fault because the manufacturer did not include the necessary rust inhibitors. In May, the NELP test units were returned to Better Engineering for replacement due to rust. The sites also experimented with Daraclean 282 liquid and Natural Orange Powder. NAS North Island was able to work with Daraclean 282, adjusting the temperature and concentration to reduce rust, while NS Mayport switched to Natural Orange Powder, which is supplied commercially with Better Engineering units and has been used in the LMTCE study and aboard the USS THEODORE ROOSEVELT. Eventually, NAS North Island also switched to Natural Orange Powder. The following table summarizes the advantages and disadvantages observed with each detergent during the test period.

Detergent	Manufacturer	Advantages	Disadvantages	Overall Results
Natural Orange Liquid	Giant Cleaning Systems	Liquid detergent easier to mix.	Unable to evaluate properly as the detergent lacked a rust inhibitor due to factory error.	Cabinet rusted due to bad batch of detergent with no rust inhibitor. Units returned for replacement because of rusted cabinets.
Daraclean 282 Liquid	W.R. Grace	Liquid detergent easier to mix.	Requires high temperature (190°F) and high concentration (7% to 8%). Therefore, foaming and evaporation increase and water level must be checked often.	Rust in cabinets as well as outside where condensate forms. Slightly improved cleaning ability.
Natural Orange Powder	Giant Cleaning Systems	Less expensive than liquid detergent.	Unable to clean SE wheel bearings, brake caliper parts, and NC8 actuators effectively.	Slightly improved cleaning of some parts. Not used long enough to accurately evaluate performance.

These results suggest that the choice of detergent will vary with the specific needs and experience of each site.

Regular maintenance and strict compliance with the manufacturer's instructions are critical for the successful operation of these units. A stuck float caused one of the NAS North Island units to flood. The cause was later identified as a failure to follow recommended weekly maintenance procedures. The NS Mayport units were occasionally used at temperatures well below the recommended range (80^{o}F), resulting in foaming and spilling. NS Mayport personnel expressed dissatisfaction with the water level control system and the 2 hours required to heat the solution to the recommended temperature range. This view was not expressed by NAS North Island.

Consumables, including filters and detergent, have been difficult to obtain through the Navy stock system. Supplies ordered in September 1995 had still not been delivered by February 1996. During the 1-year test period, approximately 70 gallons of detergent were consumed.

Although filters are consumable items, they may be cleaned and reused. NS Mayport steam-cleaned the filter bags and reused them three times.

4.2.4 Interface with Site Operations

All common ground support equipment (GSE) and airframe parts, with the exception of aircraft wheel bearings, are authorized to be cleaned in the aqueous parts washer. The operator is able to complete other tasks while the unit is running. Consumables such as Natural Orange detergent and defoamer are available through the Navy stock system.

In general, the aqueous parts washers have interfaced well with existing site operations.

4.2.5 Overall Performance

Although the costs and environmental benefits are significant, the NELP test units exhibited below-average performance compared with the Better Engineering aqueous parts washers currently being used in the Navy. The units are very sensitive, so the exact procedures in the technical manual must be followed. NS Mayport personnel stated that, in some cases, their units provided inferior cleaning performance and reliability compared with their existing equipment.

Although NAS North Island personnel are pleased with the performance of the equipment, they expressed concern about manufacturing quality. The aqueous parts washer concept is excellent, and potential benefits are significant. However, the unit requires an inordinate amount of regular maintenance. These shortcomings must be overcome to improve overall performance, but uncontrollable circumstances such as the bad batch of detergent also affected the units' performance.

5.0 LESSONS LEARNED

- Increase operator training. Although the initial rust problem was due to a manufacturing defect in the detergent, the subsequent rust problems highlighted the need to follow the initial start-up and maintenance procedures outlined in the technical manual. By following the initial start-up procedure, the metasilicate in the detergent coats all interior surfaces of the unit. Each subsequent use adds to the coating.

- Check detergent concentration and temperature regularly to ensure they are within the manufacturer's recommended levels.

- Perform weekly maintenance as outlined in the technical manual.

- Make the following unit design changes.

  – Specify stainless steel interiors to minimize the occurrence of rust inside the cabinet.

6.0 CONCLUSIONS

The P2 goals for this program have been realized as demonstrated through the implementation of the aqueous parts washer units at NS Mayport and NAS North Island. Several of the expected benefits were met.

- Replaced hazardous solvent with a nonhazardous, biodegradable detergent, eliminating disposal costs of hazardous waste.

- Improved the work environment because of the closed-loop system.

- Reduced the quantity and toxicity of the wastestream.

- Reduced labor hours for cleaning parts.

- Decreased overall labor hours in addition to providing savings quantified in the cost analysis because the operator is able to perform other tasks while the aqueous parts washer is running.

PREPRODUCTION INITIATIVE-NELP
AQUEOUS PARTS WASHER (SMALL)
GENERAL DESCRIPTION

P2 Opportunity: Use non-hazardous, biodegradable aqueous detergent in a closed-loop parts cleaning system as a substitute for 1,1,1 trichloroethane in cleaning operations. Replace ultrasonic cleaners, vapor degreasers, and solvent tanks at the I-level.

Equipment Description: Aqueous parts washers are cleaning cabinets with spray nozzles positioned along the interior walls and ceiling that direct a heated, high-pressure stream of water and detergent at parts to be cleaned. The combination of high temperature and high blasting pressure removes dirt, grime, oil, grease, and fluorescent penetrants.

Implementation Requirements:

- Electric: 240V, 1 phase
- Water: Standard building gpm flow rate
- Ventilation: Not required but recommended for low-ceiling or confined locations

Benefits:

- Reduce labor time to clean parts—25% compared with Safety Kleen tank and 50% compared with P-D-680 tanks.
- Replace hazardous solvents with a biodegradable detergent.
- Reduce disposal costs of hazardous waste.
- Provide a healthier work environment.
- Reduce quantity and toxicity of waste stream—45% compared with P-D-680 tanks and 27% compared with Safety Kleen tanks.

Other Information: Sludge must be periodically removed from the unit sludge trap and disposed of as solid waste. Authorization may be required to clean certain parts using this method.

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Technical Activity POC: Chris Mahendra, 4.8.2.5 Tel: (908) 323-7131

Vendor(s): Better Engineering Manufacturing, Inc. Model: F-3000-N

FY/Site(s): 1994 NELP Initiative, NS Mayport

Cost: $8,748 (1 unit)

PREPRODUCTION INITIATIVE-NELP
AQUEOUS PARTS WASHER (SMALL)
COST ANALYSIS

PROTOTYPE SITE: NS Mayport

DESCRIPTION: Cleans parts using a biodegradable aqueous solution in a closed-loop system with spray nozzles located along the interior walls and ceiling to direct the cleaning solution. High temperatures and blasting pressure combine to remove dirt and grease from parts without the use of 1,1,1 trichloroethane or other ozone-depleting cleaning solvents.

DATA COLLECTION PERIOD: July 1995 - February 1996

COST SAVINGS: The site previously used a Safety Kleen immersion tank for parts washing, which required hand brushing and soaking parts in solvent. The waste solvent is disposed of as hazardous waste under contract with Safety Kleen, which provides a service schedule for the collection and disposal of waste solvent. Many other sites use a P-D-680 dip tank; therefore, a cost comparison is provided for this method as well.

PREVIOUS METHOD: Safety Kleen Tank

The service schedule specified for the Safety Kleen Model 34 parts cleaner is 4 weeks, at a rental cost of $144.37 per month. A service representative drains the spent Safety Kleen solvent, refills with fresh solvent, and disposes of the used solvent. Model 34 has a 30-gallon tank capacity. The site has stated that cleaning parts using the Safety Kleen system takes approximately the same amount of time as the aqueous parts washer. However, the operator can perform other tasks while parts are being cleaned in the aqueous parts washer, which is not possible with the Safety Kleen tank.

Service

Cost per month: $144.37
Cost per year: $1,732.44

Labor

E-3 labor rate per hour: $10.39
Time per part: 20 minutes
Throughput per week: 50 parts
Throughput per year: 2,600 parts
Cost per year: $9,004.67

Waste Disposal

Thirty (30) gallons of waste are generated per month. Waste disposal costs are included in the Safety Kleen contract for a monthly service fee of $144.37 per Safety Kleen unit.

Total Annual Costs

Item	Cost
Service	$1,732.44
Labor	9,004.67
Waste Disposal	N/A
Total	$10,737.11

PREVIOUS METHOD: P-D-680 Tank

The P-D-680 tank is similar to the Safety Kleen tank but utilizes the non-proprietary solvent P-D-680.

Consumables

Solvent: P-D-680 Type II
Cost per month: $440.00
Cost per year: $5,280.00

Labor

E-3 labor rate per hour: $10.39
Time per part: 30 minutes
Throughput per week: 50 parts
Throughput per year: 2,600 parts
Cost per year: $13,507.00

Waste Disposal

Item disposed of: Spent P-D-680 Type II solvent mixture
Cost per month: $300.00
Cost per year: $3,600.00

Total Annual Costs

Item	Cost
Consumables	$5,280.00
Labor	13,507.00
Waste Disposal	3,600.00
Total	$22,387.00

NELP METHOD: Aqueous Parts Washer Unit (Model 300-P and Model 200)

Consumables

Item: Daraclean 282 detergent
Cost per gallon: $17.25
Cost per month (5 gallons): $86.25
Cost per year: $1,035.00

Item: Better Engineering Defoamer (NAT-DF)
Cost per year: $44.85

Labor

E-3 labor rate per hour: $10.39
Time per part: 15 minutes
Throughput per week: 50 parts
Throughput per year: 2,600 parts
Cost per year: $6,753.50

Waste Disposal

Amount of sludge to be disposed of per 3-week period: 250 cc
Cost per 3-week period: $29.00
Cost per year: $505.00
Cost per one 55-gallon drum of hazardous waste: $21.30

Aqueous solution (75 gallons) is replaced once every 6 months. It has generally been found to be nonhazardous. If the solution *is* hazardous, the yearly waste disposal cost would be as shown below. This figure includes the disposal of four 55-gallon drums of waste per year, which would be used for disposal of the 150 gallons of solution as well as the cost of the sludge above.

Yearly waste disposal cost:
$9.70 sludge/week x 52 weeks/year + [($21.30 x 2 drums) x 2 times/year] = $590.00

Total Annual Costs

Item	Cost
Consumables	$1,079.85
Labor	6,753.50
Waste Disposal	590.00
Total	$8,423.35

COST ANALYSIS SUMMARY (PER YEAR): MODEL 300-P

Safety Kleen	$10,737.11
Aqueous Parts Washer	$8,423.35
Cost Change	$2,313.76
Initial Procurement	$13,434.10
Expected Service Life	10 years
Return on Investment (per 10-year period)	$9,703.50 per unit [10 x $10,737.11] - ($13,434.10 + (10 x $8,423.35)]
Break Even	5.81 years [$13,434.10/$2,313.76]

P-D-680	$22,387.00
Aqueous Parts Washer	$8,423.35
Cost Change	$13,963.65
Initial Procurement	$13,434.10
Expected Service Life	10 years
Return on Investment (per 10-year period)	$126,202.40 per unit [10 x $22,387.00] - ($13,434.10 + (10 x $8,423.35)]
Break Even	0.96 years [$13,434.10/$13,963.65]

COST ANALYSIS SUMMARY (PER YEAR) - MODEL 200

Safety Kleen	$10,737.11
Aqueous Parts Washer	$8,423.35
Cost Change	$2,313.76
Initial Procurement	$8,747.60
Expected Service Life	10 years
Return on Investment (per 10-year period)	$14,390.00 per unit [10 x $10,737.11] - ($8,747.60 + (10 x $8,423.35)]
Break Even	3.78 years [$8,747.60/$2,313.76]

P-D-680	$22,387.00
Aqueous Parts Washer	$8,423.35
Cost Change	$13,963.65
Initial Procurement	$8,474.60
Expected Service Life	10 years
Return on Investment (per 10-year period)	$130,888.90 per unit [10 x $22,387.00] - ($8,747.60 + (10 x $8,423.35)]
Break Even	0.63 years [$8,747.60/$13,963.65]

Two items need to be mentioned that have not been taken into account in this analysis. First, cost and labor hour savings can be realized by cleaning several parts simultaneously in the aqueous parts washer. One aqueous parts washer can do the work of three Safety Kleen units. Many activities are currently using aqueous parts washers to do the work of several chemical solvent units.

The aqueous parts washer provides the following process improvements over the existing method (Safety-Kleen tanks).

- Although the labor hours appear to be the same for the two methods, they double for each additional component cleaned in the Safety Kleen tanks. However, because the aqueous parts washer can clean multiple parts, there is no increase in labor hours.

- Three Safety Kleen tanks would have to be procured to match the maximum utility of one aqueous parts washer.

Data gathered for this analysis are compiled from military activities included in the LMTCE Jacksonville report "High Pressure Spray Parts Washers: I-level Prototype Study," dated 3 March 1994; "Environmental Compliance Cook Book," based on pollution prevention equipment aboard the USS THEODORE ROOSEVELT; "Pollution Prevention Study for PWC-T NAS Mayport" prepared by Pacific Environmental Services; Utah National Guard "Hazardous Waste Minimization and Pollution Prevention Leadership Demonstration Project of 21 May 1992"; data from the TECHEVAL of the aqueous parts washer currently being evaluated at NAWCAD Patuxent River, MD; and data from the East Coast NELP site, NS Mayport, FL.

PREPRODUCTION INITIATIVE-NELP
AQUEOUS PARTS WASHER (SMALL)
TEST PLAN

1.0 OBJECTIVE

This test plan describes the process data collection procedure for the aqueous parts washers. The data will be used to determine the systems' efficiency, effectiveness, overall performance, and ability to interface successfully with site operations. Recommendations for fleetwide purchase will be based on your input.

2.0 DESCRIPTION

Currently, AIMD Airframe parts are cleaned in a P-D-680 dip tank. These parts include aircraft tires (rims) and panels, which are manually scrubbed using P-D-680—a known health hazard. The closed-loop aqueous parts washing system will eliminate consumption of this hazardous solvent and reduce labor hours and frequency of solvent disposal—saving both time and money.

3.0 TEST PLAN

This test plan will be used to evaluate the effectiveness of the aqueous parts washer units compared to current manual washing methods.

3.1 Approach

Quantitative and qualitative data will be acquired by completion of Tables 1 and 2.

3.1.1 Instructions for Completing Table 1

- **Date:** Indicate dates the aqueous parts washer unit was used (month and day).
- **Item Use**
  - **Parts Washed:** List parts washed for each date entered.
  - **Quantity:** Indicate the quantity or volume of parts washed for each date entered.
  - **Frequency:** Indicate the frequency of usage on a given date (*e.g.*, 1, 2, 3 times).
- **Quantity Consumables Used:** Indicate the quantity or volume of consumables (*e.g.*, detergent and defoamer) added to the unit for each date entered.
- **Time/Task:** Indicate the time required to complete each task (*e.g.*, the cycle time per batch of parts).

- **Downtime/Month**
  - **Time Period:** Record time periods when the unit is not in use.
  - **Reason:** Explain whether downtime was due to repairs, maintenance, workload, or other factors.
- **Repair Time:** Indicate time required to repair the unit.
- **Repair Parts Required and Cost:** List repair parts required and cost.
- **Consumables Ordered:** Record dates consumables were ordered as well as the type, quantity, and cost.
- **Qualitative Assessment:** Provide a narrative evaluation of the cleaning abilities of the aqueous parts washer unit. Briefly discuss:
  - Efficiency of this method (*e.g.*, time and cost savings)
  - Ease of use and the unit's ability to successfully interface with site parts cleaning operations
  - Overall satisfaction with the cleanliness of the parts (compared to parts washed by previous methods)
  - State method of determining cleanliness, as well as any additional cleaning required after wash.

3.1.2 Instructions for Completing Table 2

- **Date:** Indicate dates the aqueous parts washer was used (month and day).
- **Operating Water Temperature:** Indicate water temperature at which the unit was used for each day recorded.
- **Operating Water Pressure**: Indicate water pressure at which the unit was used for each day recorded.
- **Contaminants Removed:** List contaminants removed through entrapment in filter, sludge collection, and dissolution in wastewater.

- **Flash Rust of Steel Parts:** Based on visual observation, indicate “yes” or “no” if there is evidence of flash rust of steel parts. If “yes,” list the specific parts that experienced flash rust in the Qualitative Assessment section.

- **Water Pressure Damage:** Based on visual observation, indicate “yes” or “no” if parts were damaged due to water pressure. If “yes,” list the specific parts that experienced water pressure damage in the Qualitative Assessment section.

- **Detergent Retention:** Based on visual observation, indicate “yes” or “no” if there is evidence of detergent retention on washed parts. If “yes,” list the specific parts that had evidence of detergent retention in the Qualitative Assessment section.

- **Water Entrapment in Parts:** Based on visual observation, indicate “yes” or “no” if parts were damaged due to water entrapment. If “yes,” list the specific parts that experienced water entrapment in the Qualitative Assessment section.

- **Solution Foaming:** Based on visual observation, indicate “yes” or “no.” Record any further comments in the Qualitative Assessment section.

- **Interior Corrosion of Unit:** Based on visual observation, indicate “yes” or “no.” Record any further comments in the Qualitative Assessment section; note the exact location of the corrosion.

- **Qualitative Assessment:** Include specific details on any of the above sections marked “yes.”

4.0 REPORTING

The data entry forms are a concise method of data collection. Forms should be completed on a daily basis. Data will be collected for 1 year. During this time, periodic status reports on the testing will be submitted to NAWCADLKE. The final report will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations.

Table 1

Date	Item Use			Quantity Consumables Used	Time/Task	Downtime/Month		Repair Time	Repair Parts Required and Cost
	Parts Washed	Quantity	Frequency			Time Period	Reason		

Consumables Ordered

Date	Type	Quantity	Cost

Qualitative Assessment*:
Please comment on the effectiveness and efficiency of the unit.

____

____

____

____

*Attach extra sheet if required

Table 2

Date	Operating Water Temperature	Operating Water Pressure	Contaminants Removed	Flash Rust of Steel Parts	Water Pressure Damage	Detergent Retention	Water Entrapment in Parts	Solution Foaming	Interior Corrosion of Unit

Qualitative Assessment*:
Provide details on any questions answered “yes.”

____

____

____

____

*Attach extra sheets if required.

PREPRODUCTION INITIATIVE-NELP
AQUEOUS PARTS WASHER (SMALL)
FINAL REPORT

NS MAYPORT, FL AND NAS NORTH ISLAND, CA

1.0 INTRODUCTION

The U.S. Navy has adopted a proactive and progressive position toward protecting the environment and complying with environmental laws and regulations. Rather than merely controlling and treating hazardous waste by end-of-the-pipe measures, the Navy has instituted a program for Pollution Prevention (P2) to reduce or eliminate the volume and toxicity of waste, air emissions, and effluent discharges.

P2 allows the Navy to meet or exceed current and future regulatory mandates and to achieve Navy-established goals for reducing hazardous waste generation and toxic chemical usage. P2 measures are implemented in a manner that maintains Navy readiness. An additional benefit has been a general increase in operational efficiency.

The Navy has truly set the standard for the procurement and implementation of P2 equipment. The Chief of Naval Operations (CNO), Environmental Protection, Safety, and Occupational Health Division (N45), established the P2 Equipment Program, through which both the Naval Air Warfare Center Lakehurst (NAWCADLKE) and the Naval Facilities Engineering Service Center (NFESC) serve as procurement agents under the direction of (N45). P2 equipment is specified and procured under two complementary initiatives, the Preproduction Initiative (*i.e.,* technology demonstration) and the Competitive Procurement Initiative. The Preproduction Initiative directly supports both the Navy Environmental Leadership Program (NELP) for P2 shore applications and the P2 Afloat program, which prototypes and procures P2 equipment specific to the needs of ships.

This report provides an analysis of the procurement, installation, and operation of P2 equipment under the Preproduction Initiative. Technology demonstrations and evaluation were primarily performed under NELP at two designated NELP sites, NAS North Island and NS Mayport. Additional sites have been added as required to meet mission goals. The program involves defining requirements, performing site surveys, procuring and installing equipment, training operators, and collecting data during an operational test period. The equipment is assessed for environmental benefits, labor and costs savings, and ability to interface with site operations.

2.0 BACKGROUND

OPNAVINST 5090.1B bans the use of vapor degreasers at Aircraft Intermediate Maintenance Departments (AIMDs) and solvent cleaners that use 1,1,1 trichloroethane. Therefore, the primary P2 goal for this program is to implement an environmentally sound method for cleaning parts and components to replace the use of P-D-680 dip tanks and

Safety-Kleen units. Secondary goals include reducing the quantity and toxicity of the wastestream, reducing labor time, and providing a safer work environment. Surveys demonstrated that the two prototype sites, NAS North Island and NS Mayport, benefited from the use of an automated, closed-loop parts washer unit that operates independently, thereby allowing the operator to complete other tasks during the cycle time.

Both the Lead Maintenance Technology Center for the Environment (LMTCE) at NAS Jacksonville and the USS THEODORE ROOSEVELT evaluated parts washers in terms of overall effectiveness and features necessary to achieve a minimal acceptable level of cleaning. Aqueous parts washers manufactured by Better Engineering were identified as having the best overall performance among commercially available units. Options for the NELP test units were chosen in accordance with the guidelines provided by LMTCE Jacksonville and the recommendations provided by the "Environmental Cookbook" developed by the USS THEODORE ROOSEVELT. Detergents were chosen based on investigation of the qualified products list for MIL-C-29602 and consultation with NADEP Cherry Point personnel who have performed extensive comparisons of detergent performance in aqueous parts washers.

3.0 EQUIPMENT DESCRIPTION

The aqueous parts washer cleans parts using a biodegradable aqueous solution in a closed-loop system with spray nozzles located along the interior walls and ceiling to direct the cleaning solution. High temperature and blasting pressure combine to remove dirt and grease from parts without the use of 1,1,1 trichloroethane or other ozone-depleting cleaning solvents.

3.1 Specifications

The dimensions, tank size, turntable weight capacity, turntable area, and pump descriptions are:

Unit	Dimensions (W x D x H) (Inches)	Tank Size (Gallons)	Turntable Weight Capacity (Pounds)	Turntable Area (in^2)	Pump		
					hp	Flow	psi Output
Model 200	42 x 47 x 68.5	75	500	572	2	50	40
Model 300-P	57 x 59 x 72	100	1,000	1,075	5	100	60

3.2 Implementation Requirements

- Electric: Model 200: 240V, 1 phase, 60 Hz, 51A; Model 300-P: 240V, 3 phase, 60 Hz, 59A
- Water: Standard building gpm flow rate
- Ventilation: Not required but recommended for low-ceiling or confined locations (6" steam exhaust vent provided)

Model 300-P is equipped with a purification filtration system; both units are equipped with a portable titration unit for testing the solution concentration.

3.3 Benefits

- Reduce labor time to clean parts: 25% compared with Safety Kleen tanks and 50% compared with P-D-680 tanks.
- Replace hazardous solvents with a biodegradable detergent, thus reducing toxicity in wastestream.
- Reduce disposal costs of hazardous waste.
- Provide a healthier work environment.
- Reduce quantity of wastestream.

4.0 DATA ANALYSIS

Data was collected monthly from July 1995 to February 1996 based on the Operational Test Plan.

4.1 Quantitative Analysis

4.1.1 Aqueous Parts Washer vs. P-D-680 Dip Tanks

Unit	Return on Investment (per 10-Year Period)	Break-Even Point (Years)
Model 200	$130,888.90	0.63
Model 300-P	$126,202.40	0.96

4.1.2 Aqueous Parts Washer vs. Safety Kleen Unit

Unit	Return on Investment (per 10-Year Period)	Break-Even Point (Years)
Model 200	$14,390.00	3.78
Model 300-P	$9,703.50	5.81

See the Cost Analysis for a complete cost data.

4.2 Qualitative Analysis

4.2.1 Installation

Site preparation is minimal. Implementation requirements are provided in Section 3.0, Equipment Description.

4.2.2 Training

A 1-day training session was conducted to train all operators on operation, safety features, and maintenance of the units. A complete installation, operation, and maintenance manual is shipped with each unit.

4.2.3 Maintainability

Using these units according to the manufacturer's instructions will decrease the amount of maintenance required. The parts washers clean the majority of support equipment components satisfactorily. However, baked-on dirt and carbon are not typically removed in the first cycle; these parts must be manually cleaned.

Three detergents were used during the operational test period. Each was selected based on information from NADEP Cherry Point and the parts washer vendor. Natural Orange Liquid was supplied with the units. The units experienced internal rusting. It was later determined that this initial batch of detergent was at fault because the manufacturer did not include the necessary rust inhibitors. In May, the NELP test units were returned to Better Engineering for replacement due to rust. The sites also experimented with Daraclean 282 liquid and Natural Orange Powder. NAS North Island was able to work with Daraclean 282, adjusting the temperature and concentration to reduce rust, while NS Mayport switched to Natural Orange Powder, which is supplied commercially with Better Engineering units and has been used in the LMTCE study and aboard the USS THEODORE ROOSEVELT. Eventually, NAS North Island also switched to Natural Orange Powder. The following table summarizes the advantages and disadvantages observed with each detergent during the test period.

Detergent	Manufacturer	Advantages	Disadvantages	Overall Results
Natural Orange Liquid	Giant Cleaning Systems	Liquid detergent easier to mix.	Unable to evaluate properly as the detergent lacked a rust inhibitor due to factory error.	Cabinet rusted due to bad batch of detergent with no rust inhibitor. Units returned for replacement because of rusted cabinets.
Daraclean 282 Liquid	W.R. Grace	Liquid detergent easier to mix.	Requires high temperature (190°F) and high concentration (7% to 8%). Therefore, foaming and evaporation increase and water level must be checked often.	Rust in cabinets as well as outside where condensate forms. Slightly improved cleaning ability.
Natural Orange Powder	Giant Cleaning Systems	Less expensive than liquid detergent.	Unable to clean SE wheel bearings, brake caliper parts, and NC8 actuators effectively.	Slightly improved cleaning of some parts. Not used long enough to accurately evaluate performance.

These results suggest that the choice of detergent will vary with the specific needs and experience of each site.

Regular maintenance and strict compliance with the manufacturer's instructions are critical for the successful operation of these units. A stuck float caused one of the NAS North Island units to flood. The cause was later identified as a failure to follow recommended weekly maintenance procedures. The NS Mayport units were occasionally used at temperatures well below the recommended range (80^{o}F), resulting in foaming and spilling. NS Mayport personnel expressed dissatisfaction with the water level control system and the 2 hours required to heat the solution to the recommended temperature range. This view was not expressed by NAS North Island.

Consumables, including filters and detergent, have been difficult to obtain through the Navy stock system. Supplies ordered in September 1995 had still not been delivered by February 1996. During the 1-year test period, approximately 70 gallons of detergent were consumed.

Although filters are consumable items, they may be cleaned and reused. NS Mayport steam-cleaned the filter bags and reused them three times.

4.2.4 Interface with Site Operations

All common ground support equipment (GSE) and airframe parts, with the exception of aircraft wheel bearings, are authorized to be cleaned in the aqueous parts washer. The operator is able to complete other tasks while the unit is running. Consumables such as Natural Orange detergent and defoamer are available through the Navy stock system.

In general, the aqueous parts washers have interfaced well with existing site operations.

4.2.5 Overall Performance

Although the costs and environmental benefits are significant, the NELP test units exhibited below-average performance compared with the Better Engineering aqueous parts washers currently being used in the Navy. The units are very sensitive, so the exact procedures in the technical manual must be followed. NS Mayport personnel stated that, in some cases, their units provided inferior cleaning performance and reliability compared with their existing equipment.

Although NAS North Island personnel are pleased with the performance of the equipment, they expressed concern about manufacturing quality. The aqueous parts washer concept is excellent, and potential benefits are significant. However, the unit requires an inordinate amount of regular maintenance. These shortcomings must be overcome to improve overall performance, but uncontrollable circumstances such as the bad batch of detergent also affected the units’ performance.

5.0 LESSONS LEARNED

- Increase operator training. Although the initial rust problem was due to a manufacturing defect in the detergent, the subsequent rust problems highlighted the need to follow the initial start-up and maintenance procedures outlined in the technical manual. By following the initial start-up procedure, the metasilicate in the detergent coats all interior surfaces of the unit. Each subsequent use adds to the coating.

- Check detergent concentration and temperature regularly to ensure they are within the manufacturer’s recommended levels.

- Perform weekly maintenance as outlined in the technical manual.

- Make the following unit design changes.

  - Specify stainless steel interiors to minimize the occurrence of rust inside the cabinet.

6.0 CONCLUSIONS

The P2 goals for this program have been realized as demonstrated through the implementation of the aqueous parts washer units at NS Mayport and NAS North Island. Several of the expected benefits were met.

- Replaced hazardous solvent with a nonhazardous, biodegradable detergent, eliminating disposal costs of hazardous waste.

- Improved the work environment because of the closed-loop system.

- Reduced the quantity and toxicity of the wastestream.

- Reduced labor hours for cleaning parts.

- Decreased overall labor hours in addition to providing savings quantified in the cost analysis because the operator is able to perform other tasks while the aqueous parts washer is running.

PREPRODUCTION INITIATIVE-NELP
ARRESTING GEAR CABLE AUTOMATIC LUBRICATOR
GENERAL DESCRIPTION

P2 Opportunity: Use a closed-loop system to apply lubricant to arresting gear cables in order to minimize waste and spills during maintenance.

Equipment Description: The pressure lubricator is a closed-loop system that operates under low-pressure air to apply lubricant to the purchase cable. The pressurized introduction of fresh lubricant forces out spent lubricant containing such contaminants as salt encrustation, dust, and dirt resulting from normal usage and the marine environment.

Implementation Requirements: TBD

Benefits:

Reduce hazardous waste and spills caused by inefficient application of lubricant.
Enhance corrosion control and ability of lubricant to reach the cable core.
Reduce worker exposure to lubricant.
Reduce costs for procurement and disposal of lubricant.
Reduce the requirement for cleaning the non-skid deck.
Lengthen cable life due to the increased efficiency of lubricant penetration.

Other Information: TBD

Procuring Activity Manager: Jill MacIntyre, 1.1.X.7.1.J.B Tel: (908) 323-1936
Naval Air Warfare Center, Aircraft Division
Lakehurst, NJ

Technical Activity POC: Dave Piatkowski, 4.8.1.4 Tel: (908) 323-2716

Vendor(s): TBD

FY/Site(s): 1997 NELP Initiative; NAWC Lakehurst Test Site and USS George Washington

Cost: $10,500 (1 unit)

PREPRODUCTION INITIATIVE-NELP
ARRESTING GEAR CABLE CLEANING STATION
GENERAL DESCRIPTION

P2 Opportunity:	During the maintenance of arresting gear cables, replace ozone-depleting substances (ODSs) with an aqueous solution and use a cleaning station instead of buckets to reduce spills and waste.
Equipment Description:	The cleaning station consists of a cleaning tank and a rinsing tank. Each tank is continuously skimmed so that soil residue is filtered for collection and disposal. The cleaning tank has an internal heating element, and the rinsing tank has a separate heater with controls for adjusting and monitoring the temperature. The station has skimming and filtering capabilities.
Implementation Requirements:	TBD
Benefits:	Replace use of ODSs and hazardous materials. Reduce quantity and cost of hazardous waste. Provide a healthier work environment. Improve safety and efficiency because increased temperature control ensures that solutions will not exceed their flash points.
Other Information:	TBD
Procuring Activity Manager:	Jill MacIntyre, 1.1.X.7.1.J.B Tel: (908) 323-1936 Naval Air Warfare Center, Aircraft Division Lakehurst, NJ
Technical Activity POC:	Dave Piatkowski, 4.8.1.4 Tel: (908) 323-2716
Vendor(s):	TBD
FY/Site(s):	1997 NELP Initiative; NAWC Lakehurst Test Site and USS George Washington
Cost:	$10,000 (estimate for 1 unit)

PREPRODUCTION INITIATIVE-NELP
AVIATION FUEL RECYCLER
GENERAL DESCRIPTION

P2 Opportunity: Recycle JP-5 aviation fuel samples collected and segregated by the squadron for reuse in aircraft. Minimize fuel waste that is currently disposed of or used as lower grade fuel. Institute waste segregation to reduce overall hazardous waste. This opportunity is in accordance with OPNAVINST 4110.2, Hazardous Material Control and Management (HMC&M) program initiatives.

Equipment Description: The JP-5 aviation fuel recycling system includes filter/separator vessels, fuel/water separator vessel, 1,000-gpm transfer pump, 15-gpm recirculation pump, motor, 2,000-gallon working tank, and 1,000-gallon clean fuel tank. Each batch of recycled fuel undergoes quality assurance (QA) testing before it is issued to aircraft or blended in stocks.

Implementation Requirements:

- Electric: 115/220V, 1 phase
- Containment: Bermed concrete pad
- Collection Drums: Locked and labeled “JP-5 Reclaimable Only”
- Transportation: Designated defueler truck
- Procedures: Fuel farm/laboratory QA and squadron segregation standard operating procedures (SOPs)

Benefits:

- Reduce high-grade fuel waste and associated disposal costs.
- Promote waste minimization through reuse of fuel product.
- Decrease quantity of JP-5 to be procured.

Other Information: This program requires participation by squadron personnel to ensure that no other products are commingled with the JP-5. It also requires collection and QA services to be performed by fuel farm personnel.

Procuring Activity Manager: Jill MacIntyre, 1.1.X.7.1.J.B Tel: (908) 323-1936
Naval Warfare Center, Aircraft Division
Lakehurst, NJ

Technical Activity POC: Ruben Lebron, 4.8.1.6 Tel: (908) 323-7138

Vendor(s): JB Systems, Inc. (Distributor) Model: F-111 (Special)
Filterdyne (Manufacturer)

FY/Site(s): 1994 NELP Initiative, NAS North Island

Cost: $66,454 (one system)

PREPRODUCTION INITIATIVE-NELP
AVIATION FUEL RECYCLER
COST ANALYSIS

PROTOTYPE SITE: NAS North Island

DESCRIPTION: Recycles JP-5 aviation fuel samples that were collected and segregated by the squadron for reuse in aircraft. Minimizes fuel waste that is currently disposed of or used as lower grade fuel. Institutes waste segregation to reduce overall hazardous waste. This opportunity is in accordance with OPNAVINST 4110.2, Hazardous Material Control and Management (HMC&M) program initiatives. The system includes filter/separator vessels, fuel/water separator vessel, 100-gpm transfer pump, 15-gpm recirculation pump, motor, 2,000-gallon process tank, and 1,000-gallon issue tank. Each batch of recycled fuel undergoes quality assurance testing before it is issued to aircraft or blended into stocks.

DATA COLLECTION PERIOD: July 1996 - September 1996

COST SAVINGS: Previously, waste fuel products, including JP-5 samples, were segregated and stored in HazMat storage areas maintained by each squadron. A contractor, under the supervision of the fuel farm, collected waste fuels from the squadrons, commingling all the fuel grades in one tank truck. The contractor transferred the fuel to the hazardous waste/waste oil storage tanks located at the fuel farm. Fuel farm personnel estimate that approximately 600 gallons per week of this waste fuel is composed of potentially recyclable JP-5. Previous studies incorporating the number of squadrons and detachments assigned to NAS North Island indicate that up to 1,000 gallons per month of JP-5 may be reclaimed for reuse in aircraft. Because of the practice of commingling the JP-5 with other waste fuels, the exact quantity of waste JP-5 under the previous method is not known. Therefore, the cost analysis will be based on the quantity of fuel collected under the NELP method.

PREVIOUS METHOD: Disposition of JP-5 as Waste Fuel

Consumables

Potentially reusable gallons of JP-5 per month: 1,000 (approximate)
Cost per gallon: $.79
Cost per year: $9,480

Labor

The labor hours are the same as the NELP Method with the exception of sampling and equipment maintenance and operation. Therefore, the number of hours under the previous method have not been calculated; only the additional hours have been considered. The waste fuel must be collected and handled under each method.

Waste Disposal

Gallons of waste JP-5 per month: 1,000
Cost per gallon: TBD

Total Annual Costs

Item	Cost
Consumables	$9,480
Labor	0 (new hours)
Waste Disposal	TBD
Total	TBD

NELP METHOD: Aviation Fuel Recycler

Consumables

Filter/separator elements used per year: 2
Cost per element: TBD

Labor

Hours per week: 5
Labor cost: TBD

Waste Disposal

No waste disposal costs

Procurement Reduction

Gallons of recycled fuel per month: 1,000 (average to date)
Elimination of new procurement per year: $9,480

Total Annual Costs

Item	Cost
Consumables	TBD
Labor	TBD
Waste Disposal	$0
Procurement Reduction	-9,480
Total	TBD

COST ANALYSIS SUMMARY (PER YEAR)

Disposition of JP-5 as Waste Fuel	TBD
JP-5 Aviation Fuel recycler	TBD
Cost Change	TBD
Initial Procurement	$67,329.00*
Expected Service Life	10 years
Return on Investment (per 10-year period)	TBD
Break Even	TBD

*Does not include cost of spares package.

PREPRODUCTION INITIATIVE-NELP
AVIATION FUEL RECYCLER
TEST PLAN

1.0 OBJECTIVE

This test plan describes the data collection procedures for testing the Aviation Fuel Recycler. The data will be used to determine the efficiency, effectiveness, and overall success of the unit and the associated procedures. Specifically, the test plan will:

- Demonstrate that the recycled fuel meets the specifications for JP-5 aircraft fueling
- Evaluate the system's ability to interface with existing fuel farm operations and equipment
- Analyze the long-term cost savings and environmental benefits of minimizing JP-5 waste
- Evaluate equipment reliability, maintainability, and supportability.

In summary, this test plan will demonstrate the success of the fuel recycling procedure and the ability of the equipment to perform in accordance with relevant specifications for fuel quality.

1.1 Reference Documents

- Operating and Maintenance Manual F-111, Special Fuel Reclaim Filtration System (Filterdyne Filtration Systems, Inc.)
- Fuel Recycler Operational Procedures (NAWC Lakehurst document)
- Squadron Standard Operating Procedure for the Collection of Reclaimable JP-5 (Message Ser18E/234 dated 15 May 1996 from NASNI SCE)
- NAVAIR 00-80T-109, Aircraft Refueling NATOPS Manual
- MIL-T-5624, Turbine Fuel, Aviation Grades JP-4 and JP-5
- MIL-HDBK-200G, Quality Surveillance Handbook for Fuels, Lubricants, and Related Products
- MIL-HDBK-844(AS), Aircraft Refueling Handbook

2.0 DESCRIPTION

The Aviation Fuel Recycler will be used to recycle JP-5 aviation fuel samples (that are collected and segregated by the squadron) for reuse in aircraft or other aircraft applications. The majority of these samples are from daily preflight checks performed on each aircraft scheduled for flight. One quart JP-5 samples are drawn from the aircraft fuel tanks to ensure fuel quality. Previously, handling procedures at NAS North Island (NASNI) dictated that JP-5 samples and other lower grade waste oils be disposed of through the DRMO. A new squadron segregation SOP (Message Ser18E/234) was released by NASNI SCE in May 1996 in conjunction with the NAWCADLKE NELP fuel recycler test program. Through careful segregation of the JP-5 samples and the use of a filter/separator system (such as the prototype Aviation Fuel Recycler), this type of waste can be minimized and the fuel reused for its originally intended purpose.

To ensure safety, the recycled fuel must meet all pertinent fuel quality specifications before reuse in aircraft. This test plan will verify that the recycled JP-5 fuel quality conforms with these specifications. Comments about the ability of the system to interface effectively with current Navy procedures and operations will also be logged. In addition, the quantity of reusable fuel produced will be documented to demonstrate the long-term cost savings and associated environmental benefits of fuel recycling as a form of waste minimization.

2.1 Prerequisites for Operation

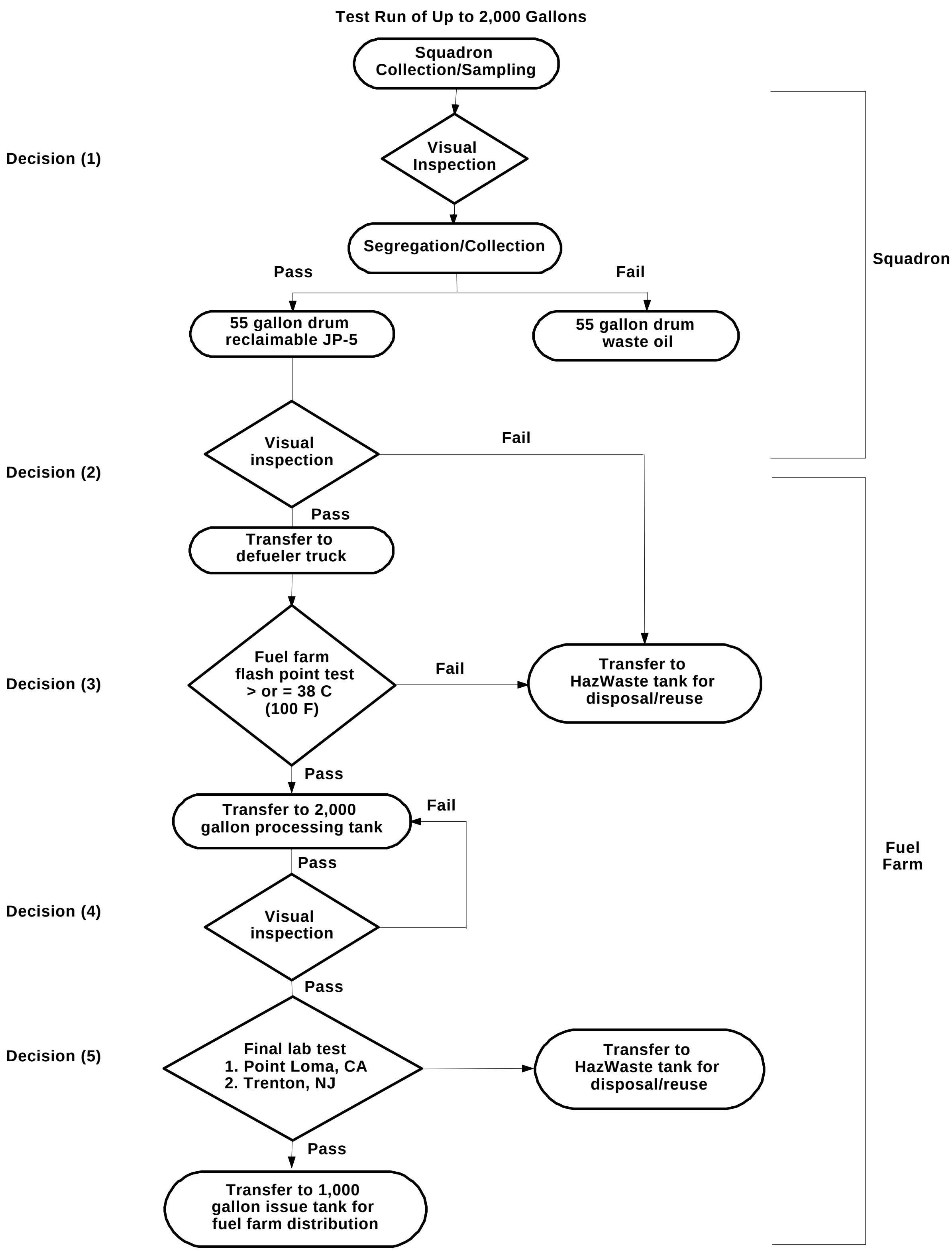
Each squadron must adhere to the Fuel Segregation SOP (Message Ser18E/234) and designate one or more locking collection drums labeled “Reclaimable JP-5.”

2.2 Fuel Recycling Test Procedure and Quality Assurance

The following section describes individual procedures and the necessary interface among the squadrons, fuel farm, and quality assurance testing laboratories. Figure 1 illustrates this process.

2.2.1 Squadron Collection and Accountability

Each NASNI squadron has access to a regulated hazardous material (HazMat) storage area. Current procedures for handling HazMat mandate that different types of waste be segregated. As a result of preflight sampling or pencil draining, waste JP-5 fuel will continue to be segregated in this manner. However, it will be emphasized that squadron personnel are responsible for safety and quality assurance in the segregation/recycling process. As described in the above-referenced squadron collection and segregation SOP, only JP-5 fuel can be placed in the collection drums designated “Reclaimable JP-5.” No other products will be commingled with the JP-5 fuel. Acceptable JP-5 fuel will contain no contaminants other than particulates or water.



Note: Samples will be drawn for the 2,000 gallon tank before circulation begins for analysis by Point Loma and Trenton as a means of comparison with the recycled product.

Figure 1. Fuel Recycling Procedure Flow Diagram

JP-5 fuel that is suspected of containing any other form of contamination (*e.g.,* dye, gross contamination, suspect contamination due to aircraft engine problems) will not be accepted or collected for recycling. Detachments that share the HazMat storage area of a host squadron will also comply with the fuel collection and segregation SOP.

Each squadron is accountable for the fuel it collects. Fuel samples and pencil drainings will be accepted or rejected based on water and particulate content, appearance, or suspicion of contamination. Before being placed in the reclaimable JP-5 drum, it is suggested that acceptable samples be logged in a ledger book by date, quantity, and responsible person. Unacceptable samples will also be logged by date, quantity, responsible person, and the reason for unacceptability. Unacceptable samples will be disposed of through previously established methods (*i.e.,* the fuel farm waste oil truck will continue to pick up all squadron waste petroleum products).

Squadron personnel will be apprised of the following key criteria.

- **Acceptable Fuel:** Fuel that is clear, bright, and not suspected of contamination other than particulates and water will be collected in the reclaimable JP-5 drum.

- **Unacceptable Fuel:** Fuel that appears to be grossly contaminated, contains dyes, or is suspected of contamination will be collected in the waste oil/recyclable oils drum.

2.2.2 Fuel Farm Approval and Pick-Up

When a reclaimable JP-5 drum is almost full, squadron personnel responsible for the HazMat storage area will notify the fuel farm. The fuel farm will schedule the defueler truck that is designated for reclaimable JP-5 collection to pick up the fuel for recycling. The designated defueler will make regular rounds of the squadron HazMat collection areas to defuel the reclaimable JP-5 drums.

Fuel farm personnel will visually inspect a sample of the contents of the drums before defueling. Such samples will be visually inspected to ensure that the fuel in the drum:

- appears clear and bright

- is free of gross particulate or water contamination.

If the fuel sample fails any of these criteria, the fuel farm will dispose of the entire contents of the drum as waste oil. (The waste oil truck will be dispatched as soon as possible to remove the unacceptable fuel. To prevent contamination, the designated reclaimable JP-5 defueler will not be used to remove unacceptable JP-5.) Fuel that meets the criteria will be defueled by fuel farm personnel into the designated reclaimable JP-5 defueler truck.

2.2.3 Fuel Farm Operation of Recycling System

The reclaimable JP-5 defueler truck will complete its squadron collection schedule and defuel into the 2,000 gallon processing tank. Before defueling into the tank, a sample of fuel will be tested in the fuel farm laboratory to ensure that the flash point is greater than or equal to 38°C (100°F). If the flash point ***is not*** acceptable, the fuel will be defueled into the fuel farm hazardous waste (waste oil) tank located adjacent to the Fuel Recycler Unit. If the flash point ***is*** acceptable, the fuel will be defueled into the Fuel Recycler's 2,000 gallon processing tank.

NOTE: A minimum acceptable flash point of 38°C allows for the reclamation of fuel that is a mixture of JP-5 and JP-8/JetA. This maximizes the amount of potentially reclaimable fuel.

Each time the JP-5 defueler truck defuels into the processing tank, a 1 gallon sample will be drawn from the first sample port located before the filter/dehydrator vessel. The sample will be labeled "Dirty" and include the date and assigned batch number. The sample should be stored safely until the current batch of fuel has been recycled.

During the test period, one batch of fuel shall equal approximately 1,000 gallons. Upon accumulating one batch of fuel in the processing tank, the system will be activated and the fuel will be cycled continuously through the filter/separator system. The number of cycles will depend on the relative cleanliness of the fuel. After one complete pass (cycle) of fuel through the system, use the sample port near valve V4 to draw a sample of fuel. (One complete pass requires approximately 67 minutes if 1,000 gallons of fuel are in the processing tank. See Fuel Recycler Operating Procedures for further guidance.) Visually inspect the sample. If particulate or water contamination is still apparent, an additional cycle through the filter/separator will be required. Examine another sample at the completion of this additional cycle. Repeat this process until the fuel passes the visual exam. It is anticipated that each batch of fuel will require only one pass through the system in order to meet specifications.

After passing the visual exam, duplicate 1 gallon samples will be sent to the fuel testing laboratories at Point Loma, CA, and NAWCAD in Trenton, NJ. The samples will be labeled "Clean" and include the date and batch number. All "Dirty" samples with corresponding batch numbers will be sent to NAWCAD Trenton at this time as well. (It is not necessary to send "Dirty" samples to Point Loma.)

WARNING: The recycled batch of fuel shall **not** be transferred to the 1,000 gallon issue tank until acceptable results are received from both laboratories.

2.2.3.1 Method of Shipping Samples to Laboratories

Samples shall be shipped using standard red shipping containers and 1 quart glass bottles. For a complete sampling kit, use NSN 8115-00-719-4111.

Samples shall be shipped by the most expeditious means. When shipping samples to NAWCAD Trenton, the use of Federal Express Government Services is encouraged. It is recommended that “Dirty” and “Clean” samples from each batch be shipped as matched pairs to facilitate evaluation of the recycling unit’s efficiency. For example, if the defueler truck defueled into the processing tank twice to create a batch of approximately 1,000 gallons, then NAWC Trenton should receive two “Dirty” samples (one “Dirty” sample from each time the truck defueled into the system) and one “Clean” sample (after the fuel has been cleaned by the system) for a total of three samples that all correspond to the same batch number. Identical clean samples from the same sources would be sent to Point Loma.

The address for shipments to NAWCAD Trenton is:

NAWCAD Trenton
Attn: AIR-4.4.5 (J. Cummings/R. Kamin)
1440 Parkway Avenue
Trenton, NJ 08628-0176

Samples will be delivered to Point Loma in person as per normal QA operating procedures.

2.2.4 Results of Laboratory Analysis

The Point Loma and NAWCAD Trenton laboratories will perform limited specification testing of the fuel samples received. The tests performed will be those specified in MIL-HDBK-200G for B-1 testing of JP-5. If the results of the B-1 tests meet ***all*** of the use limits specified in Appendix B of NAVAIR 00-80T-109 (except that the minimum acceptable flash point shall be 38°C), the fuel will be declared suitable for aircraft use.

Results of the fuel testing will be provided via fax to NASNI fuel farm within 5 working days of receipt of fuel samples. If complete results cannot be provided within this time frame for any reason, partial results (annotated with the date and time final results are expected and the reason for delay) will be provided. Results will be reported using the attached Laboratory Analysis Data Form. The NASNI fax number is (619) 545-8838, Attn: G. Cook. A duplicate copy of the results should also be faxed to (609) 667-7586, Attn: K. Stallone, for inclusion in the final study.

If both laboratory analyses agree that the fuel is acceptable for aircraft use, the fuel farm will transfer the entire batch of fuel to the 1,000 gallon issue tank for distribution (*e.g.*, for aircraft, SE, or other uses). If either laboratory concludes that the fuel is unacceptable for aircraft or other usage, the entire batch of fuel will be transferred to the waste oil (hazardous waste) tank.

3.0 TEST PLAN

This test plan will be used to evaluate the effectiveness of the Aviation Fuel Recycler. Emphasis will be placed on the system's ability to produce recycled JP-5 fuel suitable for aircraft use as well as the successful integration of the fuel recycling process.

3.1 Approach

Quantitative and qualitative data will be acquired by completion of the following attached forms:

- Fuel Farm Defuel Data
- Fuel Farm JP-5 Recycling Operations Data
- Laboratory Analysis Data
- Fuel Farm Assessment of Equipment Performance, Reliability, Maintainability, and Supportability

3.1.1 Instructions for Completing Fuel Farm Defuel Data Form

The Fuel Farm Defuel Data form will be used by fuel farm personnel responsible for defueling the reclaimable JP-5 drums. ***Copies of this form must be submitted monthly.*** Fuel farm personnel will enter the following:

- **Defuel Date**
- **Squadron Identifier**
- **Approximate Quantity Defueled (Gallons)**

3.1.2 Instructions for Completing Fuel Farm JP-5 Recycling Operations Data Form

For *each* batch of fuel that is recycled through the filter/separator system, fuel farm personnel will complete a Fuel Farm JP-5 Recycling Operations Data form. ***This form must be submitted each time a batch of fuel has either been certified for reuse or transferred to the hazardous waste tank.*** A batch will equal approximately 1,000 gallons of fuel. Information must be entered on the form each time the reclaimable JP-5 defueler truck defuels into the 2,000 gallon tank to create a complete batch of fuel. This information will include:

- **Batch Number:** Assign a consecutive number to each batch processed.
- **Date:** Indicate date of defueling.
-

- **Flash Point:** Indicate results of fuel farm flash point test for each truckload of fuel.

- **Quantity Defueled into 2,000 Gallon Tank:** Enter quantity or “0” if the results of the flash point test are unacceptable.

- **Quantity Defueled into HazWaste Tank:** Enter “0” if the results of the flash point test are acceptable or enter quantity if the flash point was unacceptable.

- **Total Number of Cycles Required to Pass Visual Exam:** When the quantity of fuel stored in the 2,000 gallon tank equals a batch, the fuel will be cycled through the filter/separator system until it appears to be free of particulates and water. At this point, fuel farm personnel will record the number of cycles the fuel circulated through the system. The length of time the unit was in operation should also be included whenever possible.

- **Quantity/Date Transferred to 1,000 Gallon Issue Tank or to Hazardous Waste Tank:** Record which tank the recycled fuel was transferred to (*i.e.,* the issue tank or the adjacent hazardous waste tank) and the quantity. Choice of tank shall be determined by the results of Point Loma and NAWCAD Trenton laboratory testing.

- **Ultimate Use of Batch:** Enter this data (*i.e.,* aircraft, SE, waste, other) if known.

3.1.3 Instructions for Completing Laboratory Analysis Data Form

The responsible personnel at each laboratory (Point Loma and NAWCAD Trenton) will report the results of the pre-recycled (“Dirty”) and recycled (“Clean”) fuel sample testing on the Laboratory Data Analysis Form. ***This form must be submitted each time a batch of fuel is analyzed.*** The form is self-explanatory, and all blocks must be completed.

NAWC Trenton will establish the reuse options for the fuel based on the lab results.

3.1.4 Instructions for Completing the Fuel Farm Assessment of Equipment Performance, Reliability, Maintainability, and Supportability Form

The Fuel Farm Assessment of Equipment Performance, Reliability, Maintainability, and Supportability form will be used to assess the fuel recycling system as follows. ***This form must be submitted monthly.***

- **Operational Time:** Using the calendar, *circle* which days of the month the filter/separator system was in operation (*i.e.,* a full batch of fuel was circulating through the system).

- **Downtime:** Using the calendar, block off periods of equipment downtime. Explain whether the downtime was due to repairs, standard maintenance, awaiting accumulation of full batch of fuel, or awaiting lab test results. Also, record estimates of labor time to:

- Perform standard maintenance tasks on the system
- Operate and monitor the system/controls
- Perform fuel quality sampling and testing tasks.

- **Repair Parts and Consumables Ordered:** Enter the date that repair parts or consumables (such as filter/separator elements) were ordered and the quantity and cost.

- **Qualitative Assessment:** Evaluate the general success of the fuel recycling method. Briefly address the following:
  - Efficiency of the system (time and cost savings)
  - Ease of use and the system's ability to successfully interface with existing site operations. State any problems or special benefits created by the unit. Comment on how labor-intensive the system is.
  - Overall satisfaction with the equipment and the recycled fuel product
  - Suggestions for improving the system or resolving any problems.

4.0 REPORTING

The data entry forms are a concise method of data collection. Data will be collected for 1 year. Completed forms will be faxed to (609) 667-7586, Attn: Karen Stallone, on a regular basis. Monthly data must be received by the 5th day of the month following each of the data collection periods. Original forms will be retained and compiled at the end of the 1 year test period as supporting documentation.

During the 1 year test period, periodic status reports will be submitted to NAWCADLKE. Pertinent findings will be reported as well. The final report will include detailed results and observations in addition to an assessment of the efficiency, cost-effectiveness, and ability of the system to interface with other site operations. Recommendations for similar fleet-wide use will be based on the input received.

FUEL FARM DEFUEL DATA FORM
(RECLAIMABLE JP-5 ONLY)

Submit Form Monthly.

Defuel Date	Squadron Name	Approximate Quantity Defueled (Gallons)*	Responsible Person

Comments:

___

___

___

* Submit one form for each batch of fuel that has been transferred either to the 1,000 gallon tank (certified for reuse) or to the HazWaste Tank.

FUEL FARM JP-5 RECYCLING OPERATIONS DATA FORM
(ONE BATCH REPORT PER FORM)

Batch Number: ______________________

Date	Flash Point of Sample from Truck	Quantity Defueled into Process Tank	Quantity Defueled into HazWaste Tank

Total # of Cycles and Length of Operational Time Required to Pass Visual Exam: ____
Quantity/Date Transferred to 1,000 Gallon Issue Tank: ____
Quantity/Date Transferred to HazWaste Tank:____
Ultimate Use (*i.e.*, aircraft, SE, waste, other):____
____
____

* Submit one form for each batch of fuel that has been transferred either to the 1,000 gallon tank (certified for reuse) or to the HazWaste Tank.

FUEL FARM ASSESSMENT OF EQUIPMENT PERFORMANCE, RELIABILITY, MAINTAINABILITY, AND SUPPORTABILITY FORM

Submit Form Monthly.

Indicate Operational and Downtime for the Month of: ______________________________

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Repair Parts and Consumables Ordered:

Item	Date Ordered	Quantity	Cost	Date Received

Qualitative Assessment:

Please comment on effectiveness and efficiency of system, provide general comments, and clarify any of the above data.

____

____

LABORATORY ANALYSIS DATA FORM

Laboratory Name:______________________________ **Date of Report:** ______________________________

Responsible Person:____________________________ **Date Fuel Samples Received:** ___________________

Batch Number:________________________________

Test	**Use Limit**	**"Dirty" Results**	**"Clean" Results**
Particulates	2.0 mg/L (maximum)	_____________	_____________
Free Water	ppm (Report)	_____________	_____________
Flash Point	38°C (minimum)	_____________	_____________
Color (Visual)	Report	_____________	_____________
API Gravity	36.0-48.0	_____________	_____________
Distillation	Minimum of 7% recovered by 205°C (400°F)	_____________	_____________
Residue	2% vol/vol (maximum)	_____________	_____________
Copper Strip	1 (maximum)	_____________	_____________
Freezing Point	Report	_____________	_____________
Existent Gum	14 mg/100 ml (maximum)	_____________	_____________
Water Reaction	Report	_____________	_____________
FSII	0.03-0.20 vol%	_____________	_____________
WISM*	Report	_____________	_____________

Recommended Use for Recycled Fuel:____
(State reason if not acceptable for use as aviation fuel.)

Comments: ____
____
____

*NAWC Trenton only

Upon completing form, fax to (619) 545-8838, Attn: G. Cook and to (609) 667-7586, Attn: K. Stallone.

PREPRODUCTION INITIATIVE-NELP
BLAST MEDIA SEPARATOR
GENERAL DESCRIPTION

P2 Opportunity: Reduce the waste generated by sodium bicarbonate blasting systems by separating the biodegradable sodium bicarbonate media from the paint waste products.

Equipment Description: The unit separates the sodium bicarbonate blast media and paint chips that result from paint removal blasting processes. Several technologies have been identified, including: dissolving sodium bicarbonate and filtering the paint chips followed by chemical precipitation of heavy metals; dry electrostatic separation; or cyclone separation by density.

Implementation Requirements: TBD

Benefits:

- Reduce volume of hazardous waste.
- Reduce hazardous waste disposal cost.

Other Information: TBD

Procuring Activity Manager: Jill MacIntyre, 1.1.X.7.1.J.B Tel: (908) 323-1936
Naval Air Warfare Center, Aircraft Division
Lakehurst, NJ

Technical Activity POC: Gabrielle Korosec, 4.8.1.4 Tel: (908) 323-7130

Vendor(s): TBD

FY/Site(s): 1997 NELP Initiative, NS Mayport

Cost: $50,000 estimate (1 unit)

PREPRODUCTION INITIATIVE-NELP
CAN CRUSHER/BALER
GENERAL DESCRIPTION

P2 Opportunity: Eliminate 1- to 5-gallon cans from solid wastestream. In loose form, the cans/pails are not accepted by DRMO for recycling. The local recycler stipulates acceptance of only baled cans to be melted down and used as scrap metal.

Equipment Description: The can baler produces ultra-high platen compression forces necessary to properly bale 1- to 5-gallon cans. With a chamber size of 24" deep x 24" wide x 38" high, this 15-hp unit produces 500-lb. bales within a cycle time of 58 minutes.

Implementation Requirements:

- Electric: 208V, 3 phase
- Weather Protection: Roof overhang
- Support Equipment: Forklift to unload trucks
- Materials: Wire ties to tie off bales

Benefits:

- Save costs by recycling bales.
- Eliminate 1- to 5-gallon cans from solid wastestream.
- Reduce volume of solid waste.
- Reduce labor to handle, transport, and dispose of loose cans and pails.

Other Information: Compacted bales may be transported to recyclers with furnace facilities that are prepared to accept unrinsed cans and pails in baled form. Other recyclers may have different acceptance criteria.

Procuring Activity Manager:	Jill MacIntyre, 1.1.X.7.1.J.B Naval Warfare Center, Aircraft Division Lakehurst, NJ	Tel: (908) 323-1936
Technical Activity POC:	Walter Koehler, 4.8.1.4	Tel: (908) 323-7907
Vendor(s):	Waste Recycler Manufacturing Company	Model: FE2424HD
FY/Site(s):	1994 NELP Initiative, NAS North Island	
Cost:	$13,400 (1 unit)	

PREPRODUCTION INITIATIVE-NELP
CAN CRUSHER/BALER
COST ANALYSIS

PROTOTYPE SITE: NAS North Island

DESCRIPTION: Produces ultra-high platen compression force to bale 1- to 5-gallon cans for sale to a local recycler.

DATA COLLECTION PERIOD: May 1995 - August 1996*

COST SAVINGS: Previously, DRMO accepted used cans from sources throughout the base and disposed of them. Now, the cans are brought to the Recycling Center and compressed into 500 lb. bales. The bales are sold to a local recycler for approximately $65 per ton.

PREVIOUS METHOD: DRMO Disposal

Disposal cost per pound: $2.10
Pounds collected per month: 2,000
Disposal cost per month: $4,200.00
Cost per year: $50,400.00

NELP METHOD: Can Crusher/Baler

Labor

Cycle time per bale: 1.5 hours
E-3 labor rate per hour: $10.39
Cost per bale: $15.59
Quantity of bales per month: 6
Cost per year: $1,122.48

Recycling Revenue

Cost per pound: $65.00 for 2,240 pounds (1 ton)
Pounds per month: 3,000
Income per month: $90.00
Income per year: $1,080.00

Total Annual Costs

Item	Cost
Labor	$1,122.48
Recycling Revenue	-1,080.00
Total	$42.48

*The unit experienced downtime due to problems the site had instituting new can collection procedures. During that time, a minimal quantity of cans were collected, and an injunction was issued making the new procedure mandatory. Data collection resumed in April 1996.

COST ANALYSIS SUMMARY (PER YEAR)*

DRMO Disposal	$50,400.00
Can Baler Unit	$42.48
Cost Change	$50,357.52
Initial Procurement	$13,400.00
Expected Service Life	10 years
Return on Investment (10-year life)	$490,175.20 per unit [10 x $50,400.00] - [$13,400.00 + (10 x $42.48)]
Break Even	0.27 years [$13,400.00/$50,357.52]

* Figures for other sites will depend on the number of cans crushed and sold as well as the unit sale price of bales in that geographic area.

PREPRODUCTION INITIATIVE-NELP
CAN CRUSHER/BALER
TEST PLAN

1.0 OBJECTIVE

This test plan describes the process data collection procedure for the can crusher/baler. The data will be used to determine the efficiency, effectiveness, overall success of the unit to bale empty, steel, 1-to 5-gallon cans, and the unit's ability to interface successfully with the site can recycling program.

2.0 DESCRIPTION

Currently, 1- to 5-gallon cans on-site are not being crushed. To set up the can crushing and recycling program, a memorandum was issued stating that the Recycling Center will accept only cans that meet the California State definition of an empty container. Cans that formerly held paint, lube oil, grease, hydraulic fluid, antifreeze, or unused thinner or solvent (*i.e.,* virgin product) will be accepted by the Recycling Center. Galley cans will be accepted as well.

One- to five-gallon containers are considered empty if:

- No material can be poured or drained from the container when the container is held in any orientation (*e.g*., tilted, inverted).

- The container held a non-pourable material (*e.g*., grasses, sludge, dried paint, etc.) that was scraped out. No material shall remain in the container.

The Recycling Center will not accept containers that held acute hazardous waste or extremely hazardous waste. These types of waste include, but are not limited to, spent solvent, spent paint thinner, and leaded paint.

The resulting 24" x 24" x 36" bale (approximately 500 lbs) produced by the can crusher/baler will take up less space and will be easier to transport. The bales will be sold to a civilian steel recycling company. Bales shall meet size and tightness requirements.

3.0 TEST PLAN

This test plan will be used to evaluate the effectiveness of the can crushing/baling method in reducing volume, facilitating the handling of the 1- to 5-gallon cans, and recouping costs or producing funds through the sale of the crushed cans to a local recycler.

3.1 Approach

Quantitative and qualitative data will be acquired by completion of Table 1.

3.1.1 Instructions for Completing Table 1

- **Date:** Indicate dates the can/crusher baler was used (month and day).
- **Item Use**
  - **Frequency:** Indicate the frequency of usage on a given date (*e.g.*, 1, 2, 3 times).
  - **Quantity:** Indicate total quantity or volume of 1- to 5-gallon cans deposited in the unit for baling on given date.
- **Time/Task:** Record time per unit task (*i.e*., length of time required to collect enough cans for baling; the time to bale them; and the time to unload the bale for transport to the recycler).
- **Downtime/Month**
  - **Time Period:** Record periods when the unit was not in use.
  - **Reason:** Explain whether downtime was due to repairs, maintenance, workload, or other factors.
- **Repair Time:** Indicate time required to repair system.
- **Repair Parts Required:** List repair parts required and the cost.
- **Recycling**
  - **No. Bales Sold/Month:** Record number of bales sold per month to the recycler.
  - **Funds Received:** Indicate amount of funds received for each bale sold to the recycler.
- **Qualitative Assessment:** Provide a narrative evaluation of the abilities of the can crusher/baler. Briefly discuss:
  - Efficiency of this method (*e.g*., time and cost savings)
  - Ease of use and the unit's ability to successfully interface with site recycling operations
  - Efficiency and cost-effectiveness of the can crushing/baling method.

4.0 REPORTING

The data entry forms are a concise method of data collection. Forms should be completed on a daily basis. Data will be collected for 1 year. During this time, periodic status reports on the testing will be submitted to NAWCADLKE. The final report will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations.

Table 1

Date	Item Use		Time/Task	Downtime/Month		Repair Time	Repair Parts Required	Recycling	
	Frequency	Quantity		Time Period	Reason			No. Bales Sold/Month	Funds Received

Qualitative Assessment*:
Please comment on the effectiveness and efficiency of the unit.

____

____

____

____

*Attach extra sheet if required.

PREPRODUCTION INITIATIVE-NELP
CAN CRUSHER/BALER
FINAL REPORT

NAS NORTH ISLAND

1.0 INTRODUCTION

The U.S. Navy has adopted a proactive and progressive position toward protecting the environment and complying with environmental laws and regulations. Rather than merely controlling and treating hazardous waste by end-of-the-pipe measures, the Navy has instituted a program for Pollution Prevention (P2) to reduce or eliminate the volume and toxicity of waste, air emissions, and effluent discharges.

P2 allows the Navy to meet or exceed current and future regulatory mandates and to achieve Navy-established goals for reducing hazardous waste generation and toxic chemical usage. P2 measures are implemented in a manner that maintains Navy readiness. An additional benefit has been a general increase in operational efficiency.

The Navy has truly set the standard for the procurement and implementation of P2 equipment. The Chief of Naval Operations (CNO), Environmental Protection, Safety, and Occupational Health Division (N45), established the P2 Equipment Program, through which both the Naval Air Warfare Center Lakehurst (NAWCADLKE) and the Naval Facilities Engineering Service Center (NFESC) serve as procurement agents under the direction of (N45). P2 equipment is specified and procured under two complementary initiatives, the Preproduction Initiative (*i.e.*, technology demonstration) and the Competitive Procurement Initiative. The Preproduction Initiative directly supports both the Navy Environmental Leadership Program (NELP) for P2 shore applications and the P2 Afloat program, which prototypes and procures P2 equipment specific to the needs of ships.

This report provides an analysis of the procurement, installation, and operation of P2 equipment under the Preproduction Initiative. Technology demonstrations and evaluation were primarily performed under NELP at two designated NELP sites, NAS North Island and NS Mayport. Additional sites have been added as required to meet mission goals. The program involves defining requirements, performing site surveys, procuring and installing equipment, training operators, and collecting data during an operational test period. The equipment is assessed for environmental benefits, labor and costs savings, and ability to interface with site operations.

2.0 BACKGROUND

NAS North Island previously handled cans by having the DRMO collect them from various sites on base and dispose of them. Currently, cans are brought to a central location at the Recycling Center, compressed into 500 lb bales, and sold to a local recycler.

The P2 goal of the can crusher/baler is to eliminate 1- to 5-gallon cans and pails from the solid wastestream. In loose form, cans are not accepted by the DRMO for recycling. The local recycler stipulates acceptance of baled cans only, which are then melted down and used as scrap metal.

A vendor search revealed that the Model NF 3038HD can crusher/baler manufactured by Waste Recycler Manufacturing Company was the best overall choice for this application.

3.0 P2 EQUIPMENT DESCRIPTION

3.1 Specifications

The can crusher/baler produces ultra-high platen compression forces necessary to properly bale 1- to 5-gallon cans. With a chamber size of 24" deep x 24" wide x 38" high, this 15-hp unit produces 500 lb bales (steel) within a cycle time of 58 minutes.

3.2 Implementation Requirements

- Electric: 460V, 60 amps, 3 phase
- Weather protection: Roof overhang
- Materials: Wire ties to tie off bales
- Support equipment: Forklift to maneuver formed bales

3.3 Benefits

- Reduce waste disposal costs by recycling bales.
- Eliminate 1- to 5-gallon cans from solid wastestream.
- Reduce volume of solid waste.
- Reduce labor to handle, transport, and dispose of loose cans and pails.

4.0 DATA ANALYSIS

Data was collected from May 1995 through August 1996 in accordance with the Operational Test Plan.

4.1 Quantitative Analysis

The can crusher/baler costs $13,400.00 for initial procurement with annual operating and maintenance costs of $1,122.48 and annual recycling revenues of $1,080.00. The 10-year return on investment totals $490,175.20. The break even point is .27 years. See the Cost Analysis for complete data.

4.2 Qualitative Analysis

4.2.1 Installation

Installation of the unit did not require significant effort. The only installation requirements of the can crusher/baler are an electric supply and enough space for the machine when open (74" x 70" x 139"). The unit was delivered to the site on March 22, 1995 and was operational by April 3, 1995.

4.2.2 Training

A 1-day training session at NAS North Island covered the following:

- Safety, kill switch, and eject bale features
- Proper procedure to load and tie off bale
- Demonstration of a full cycle to show baler operation
- Copies of maintenance/operations manual.

4.2.3 Maintainability

During the data collection period, the only work required was a minor structural weld repair. Beyond this, the can crusher/baler performs well, with little effort required to crush and bale cans for recycling.

4.2.4 Interface with Site Operations

The can crusher/baler was initially used only for cans from a limited number of site sources. It was then determined that the galley should contribute cans to the operation. Downtime was experienced while proper collection channels were established; however, once the collection procedures and criteria were finalized, the can crusher/baler was used more frequently with a subsequent increase of incoming cans. As a result, sales of cans for recycling also increased.

4.2.5 Overall Performance

NAS North Island is quite pleased with the performance of the can crusher/baler. In fact, the biggest issue arising during this test period has been collecting more cans to increase usage of the unit and in turn recycle even more of the waste cans generated on base.

5.0 LESSONS LEARNED

Initially, there were not enough cans for routine crushing and baling cycles to be performed. Thus, it was determined that the galley would become a major contributor. Establishing proper collection channels resulted in downtime. However, once the standard collection procedure was established, the machine was used more frequently, and waste reduction and recycling goals were met.

In the future, proper collection channels and a standard procedure should be established before the system is operational because most downtime is simply the result of not having enough cans collected for a crushing and baling cycle to be performed. Local recyclers should also be contacted in advance to determine any relevant acceptance criteria. The contents of the cans to be recycled should be investigated, and relative cleanliness requirements should be stipulated to generators of waste cans throughout the base.

6.0 CONCLUSIONS

The can crusher/baler accomplished the goal of reducing the solid wastestream and providing cost savings through the sale and recycle of used cans and pails. For this unit to be successful at other sites, a local recycler should be in place to accept the 500 lb bales of cans produced by the unit. The site must contribute enough cans to warrant performing each crushing and baling cycle, and arrangements should be made to transport the bales. Overall, this unit is recommended for all Navy sites that generate significant quantities of waste cans.

PREPRODUCTION INITIATIVE-NELP
DRUM CONDITIONER
GENERAL DESCRIPTION

P2 Opportunity: Navy activities frequently collect hazardous waste from base generators using 55-gallon drums. After pumping out the waste, the drums are disposed of as hazardous waste. However, the drums can be cleaned and reused, thereby reducing hazardous waste.

Equipment Description: This preproduction project evaluates the use of a 55-gallon drum conditioner/recycler. This equipment triple-rinses contaminated drums inside an enclosed chamber. The unit uses heated water with a detergent dispensing system and rinse cycle. The unit has both interior and exterior washing capability. Wastewater is tested for hazardous contaminants. The unit features stainless steel construction, recirculating rinse tanks, and live steam capability.

Implementation Requirements: The unit can be installed outside in a bermed area in temperate climates. The unit must be plumbed and provided with electrical service.

Benefits:

- Eliminate disposal of drums as hazardous waste, thereby reducing hazardous waste quantities per DOD measure of merit mandating 50% reduction in hazardous waste disposal by CY 1999.
- Avoid hazardous waste transportation and disposal costs. Eliminate liabilities associated with hazardous waste disposal.
- Reduce costs associated with buying new drums.

Other Information: None

Procuring Activity Manager: Mike Viggiano, Code 423 — Tel: (805) 982-4895
Naval Facilities Engineering Service Center
Port Hueneme, CA

Technical Activity POC: Julie Kercher — Tel: (619) 565-7999
Navy Public Works Center
San Diego, CA

Vendor(s): Advanced Environmental Solutions — Model: TBD
Enviro-Techniques Products, Inc.
Velcon, Inc.

Site(s)/FY: 1995 NELP Initiative, NAS North Island

Cost: $35,000 (1 unit)

PREPRODUCTION INITIATIVE-NELP
GLYCOL RECYCLER, 18 GALLONS
GENERAL DESCRIPTION

P2 Opportunity: Recycle used antifreeze from engine-driven pieces of equipment/vehicles. Minimize the quantity of spent antifreeze (glycol) that must be disposed of and the potential for spills to the environment. Used antifreeze may contain a variety of dissolved heavy metals such as lead, zinc, copper, and iron. Recycling this material reduces hazardous waste generation.

Equipment Description: The glycol recycler unit is a closed-loop process that eliminates the need to drain, transport, store, and dispose of spent antifreeze. Antifreeze coolant is flushed from the engine cooling system, filtered, aerated, oxidized, and mixed with additives to neutralize acids and replace inhibitors.

Implementation Requirements:

- Size: 32.75" high x 29" long x 28" wide
- Cycle Time: 30 minutes
- Capacity: 18 gal.
- Compressed Air Supply: 30 psi maximum
- Note: Unit is portable; minimal implementation is required.

Benefits:

- Reduce requirement for procurement of new antifreeze.
- Eliminate disposal costs of used antifreeze.
- Provide a healthier work environment because a closed-loop system eliminates operator exposure to antifreeze.

Other Information: An additional cross-flow adapter and spare radiator hose section of the same size are required to service support equipment not equipped with heaters.

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Vendor(s): FPPF Chemical Company (Manufacturer) — Model: ARS-18
Florida Detroit Diesel (Distributor)

FY/Site(s): 1994 NELP Initiative, NS Mayport

Cost: $2,261 (1 unit)

PREPRODUCTION INITIATIVE-NELP
GLYCOL RECYCLER, 18 GALLONS
COST ANALYSIS

PROTOTYPE SITE: NS Mayport

DESCRIPTION: Recycles antifreeze coolant (ethylene glycol) in engine-driven equipment by flushing the coolant out of the cooling system. The antifreeze is then filtered, aerated, oxidized, and mixed with additives to neutralize acids and replace inhibitors. Spent antifreeze typically contains dissolved heavy metals that can contaminate soil and groundwater and is considered an environmental pollutant and hazardous waste.

DATA COLLECTION PERIOD: September 1995 - July 1996

COST SAVINGS: The following cost analysis compares the FPPF Chemical Co. Glycol Recycler, Model ARS-18, with disposal of spent antifreeze. The site support equipment is serviced according to a 52-week maintenance schedule. The previous method requires disposal of 16 quarts of used antifreeze when a 16-quart unit is serviced. Eight quarts of replacement ethylene glycol must be mixed with 8 quarts of water to obtain the correct glycol-to-water ratio. Recycling glycol will provide cost savings by eliminating or reducing disposal of spent glycol and procurement of replacement glycol.

UNITS TO BE SERVICED:

Unit	Capacity (Quarts)	Service Schedule (Weeks)
14 A/S32A-30A Tow Tractors	13	52 (10 units), 26 (2 units), 13 (2 units)
1 A/M27T-5 Hydraulic Power Supply	16	52
9 NC-8 MEPP	16	52 (4 units), 13 (5 units)
1 NC-10C MEPP	35	13
3 JG75 Tow Tractors	16	26
1 A/S32A-37 Tow Tractor	26	13
1 A/M32C-17 Air Conditioner	60	13

(All units are drained and refilled only once a year, regardless of the service schedule. Units with less than a 52-week service schedule are checked, and minor maintenance is performed at their scheduled intervals. Approximately 127 gallons of the spent mixture of water and antifreeze are disposed of per year.)

PREVIOUS METHOD: Replacement of Spent Antifreeze

Consumables

Gallons of pure ethylene glycol per year: 63.5
Cost per year: $302.89

Labor

E-3 labor rate per hour: $10.39
Cycle time: 1 hour (approximate)
Cycles per year: 30
Cost per year: $311.70

Waste Disposal

Gallons of antifreeze and water coolant mixture per year: 127
Waste fluid disposal cost per pound: $2.10
Pounds per year: 1,181.1
Cost per year: $2,480.31

Pounds of ethlyene glycol-coated rags generated per year: 5 to 8
Cost per pound: $2.10
Cost per year: $16.80 (maximum)

Total Annual Costs

Item	Cost
Consumables	$302.89
Labor	311.70
Waste Disposal	2,497.11
Total	$3,111.70

NELP METHOD: Recycling of Spent Antifreeze

Consumables

As an estimate, 0.5 to 1 pint of glycol extender and ethylene glycol are needed to recycle the 16 quarts of antifreeze in one unit of support equipment. Using the higher end figure (*i.e.*, 1 pint or 0.5 quarts), 41.56 quarts (or 10.39 gallons) of glycol extender and fresh ethylene glycol are needed per year.

Cost of 2.5 gallons of glyclean extender: $60.21
Cost per gallon: $24.08
Gallons needed per year: 10.39
Cost per year: $250.19

Cost of 63.5 gallons of pure ethylene glycol: $302.89
Cost per gallon: $4.77
Gallons needed per year: 10.39
Cost per year: $49.56
Cost of 1 quart of standard 10 pH buffer solution: $12.70

Labor

E-3 labor rate per hour: $10.39
Hours per cycle: 1.5
Cycles per year: 30 cycles
Cost per year: $467.55

Waste Disposal

Pounds of ethlyene glycol-coated rags generated per year: 5 to 8
Cost per pound: $2.10
Cost per year: $16.80 (maximum)

Total Annual Costs

Item	**Cost**
Consumables	$312.45
Labor	467.55
Waste Disposal	16.80
Total	$796.80

COST ANALYSIS SUMMARY (PER YEAR)

Replacement of Spent Antifreeze	$3,111.70
Glycol Recycler Alternative	$796.80
Cost Change	$2,314.90
Initial Procurement	$2,260.69*
Expected Service Life	10 years
Return on Investment (per 10-year period)	$20,888.31 per unit [10 x $3,111.70] - [$2,260.69 + (10 x 796.80)]
Break Even	0.98 years [$2,260.69/$2,314.90]

*$2,124.00 (unit cost) + $136.69 (2 micron filters, additional cross-flow adapter, pH pen, extender, and standard buffer solution) = $2,260.69

PREPRODUCTION INITIATIVE-NELP
GLYCOL RECYCLER, 18 GALLONS
TEST PLAN

1.0 OBJECTIVE

This test plan describes the process data collection procedure for the 18-gallon glycol recycler. The data will be used to determine the system's efficiency, effectiveness, overall performance, and ability to interface successfully with site operations.

2.0 DESCRIPTION

The portable 18-gallon glycol recycler will recycle antifreeze (ethylene glycol) used in various engine-driven equipment. This closed-loop process will eliminate the need to drain, transport, store, and dispose of spent antifreeze—an environmental hazard.

3.0 TEST PLAN

This test plan will be used to evaluate the effectiveness of the glycol recycler and quantify the recycled antifreeze.

3.1 Approach

Quantitative and qualitative data will be acquired by completion of Table 1.

3.1.1 Instructions for Completing Table 1

- **Date:** Indicate dates the glycol recycler was used (month and day).

- **Item Use**

  – **Frequency:** Indicate the frequency of usage on a given date (*e.g.*, 1, 2, 3 times).

  – **Quantity:** Indicate the quantity of antifreeze in each piece of support equipment.

- **Quantity Used:** Indicate the quantity or volume of Glyclean additive used on a given date to remove impurities, replace inhibitors, and restore antifreeze to original 50% strength (glycol-water 50/50 mixture).

- **Time/Task:** Record the time per unit task (*i.e.*, length of time required to complete one cycle—including time to connect the unit to the equipment to be serviced, flush out and recycle antifreeze, and return replenished antifreeze into the unit).

- **Downtime/Month**

  – **Time Period:** Record time periods when the unit was not in use.

  – **Reason:** Explain whether downtime was due to repairs, maintenance, workload, or other factors.

- **Repair Time:** Indicate time required to repair the system.

- **Repair Parts Required:** List repair parts required and cost.

- **Consumables Ordered:** Record date when Glyclean additive was ordered and the quantity and cost.

- **Qualitative Assessment:** Provide a narrative evaluation of the unit's performance. Briefly discuss:

  – Efficiency of this method (*e.g.*, time and cost savings)

  – Ease of use and the unit's ability to successfully interface with site operations

  – Overall satisfaction with the recycled antifreeze.

4.0 REPORTING

The data entry form is a concise method of data collection. The form should be completed on a daily basis. Data will be collected for 1 year. During this time, periodic status reports on the testing will be submitted to NAWCADLKE. The final report will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations.

Table 1

Date	Item Use		Quantity Used	Time/Task	Downtime/Month		Repair Time	Repair Parts Required
	Frequency	Quantity			Time Period	Reason		

Consumables (Glycean) ordered:

Date	Quantity	Cost

Qualitative Assessment*:
Provide comments on the effectiveness and efficiency of the unit.

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* Attach extra sheet if required.

PREPRODUCTION INITIATIVE-NELP
GLYCOL RECYCLER, 18 GALLONS
FINAL REPORT

NS MAYPORT, FL

1.0 INTRODUCTION

The U.S. Navy has adopted a proactive and progressive position toward protecting the environment and complying with environmental laws and regulations. Rather than merely controlling and treating hazardous waste by end-of-the-pipe measures, the Navy has instituted a program for Pollution Prevention (P2) to reduce or eliminate the volume and toxicity of waste, air emissions, and effluent discharges.

P2 allows the Navy to meet or exceed current and future regulatory mandates and to achieve Navy-established goals for reducing hazardous waste generation and toxic chemical usage. P2 measures are implemented in a manner that maintains Navy readiness. An additional benefit has been a general increase in operational efficiency.

The Navy has truly set the standard for the procurement and implementation of P2 equipment. The Chief of Naval Operations (CNO), Environmental Protection, Safety, and Occupational Health Division (N45), established the P2 Equipment Program, through which both the Naval Air Warfare Center Lakehurst (NAWCADLKE) and the Naval Facilities Engineering Service Center (NFESC) serve as procurement agents under the direction of (N45). P2 equipment is specified and procured under two complementary initiatives, the Preproduction Initiative (*i.e.,* technology demonstration) and the Competitive Procurement Initiative. The Preproduction Initiative directly supports both the Navy Environmental Leadership Program (NELP) for P2 shore applications and the P2 Afloat program, which prototypes and procures P2 equipment specific to the needs of ships.

This report provides an analysis of the procurement, installation, and operation of P2 equipment under the Preproduction Initiative. Technology demonstrations and evaluation were primarily performed under NELP at two designated NELP sites, NAS North Island and NS Mayport. Additional sites have been added as required to meet mission goals. The program involves defining requirements, performing site surveys, procuring and installing equipment, training operators, and collecting data during an operational test period. The equipment is assessed for environmental benefits, labor and costs savings, and ability to interface with site operations.

2.0 BACKGROUND

Previously, AIMD Mayport disposed of spent antifreeze from 30 different end items of support equipment, each having a cooling system capacity ranging from 3.25 to 15 gallons. Cooling systems are usually filled with a 50/50 mixture of antifreeze (ethylene glycol) and water. AIMD Mayport uses 127 gallons of this mixture each year. Yearly drain, flush, and fill maintenance procedures consume 63.5 gallons of antifreeze. However, a total of 127 gallons of coolant mixture must be disposed of as waste material, along with used rags.

The P2 goal is to recycle used antifreeze from engine-driven pieces of support equipment/vehicles, to reduce the quantity of spent antifreeze that must be disposed of, and to minimize the potential for spills. Used antifreeze may contain a variety of dissolved heavy metals such as lead, zinc, copper, and iron. Recycling this material reduces hazardous waste generation. In addition, a closed-loop process eliminates direct operator exposure to antifreeze, thereby creating a safer working environment.

After conducting a vendor evaluation, the FPPF Chemical Company Model ARS-18 glycol recycler, distributed by Florida Detroit Diesel, was selected as the best candidate. The glycol recycler unit is a closed-loop process that eliminates the need to drain, transport, store, and dispose of spent antifreeze. Antifreeze coolant is flushed from the engine cooling system, filtered, aerated, oxidized, and mixed with additives to neutralize acids and replace inhibitors.

3.0 EQUIPMENT DESCRIPTION

3.1 Specifications

- Size: 32.75" high x 29" deep x 28" wide
- Cycle time: 30 minutes
- Capacity: 18 gallons

3.2 Implementation Requirements

The unit is portable, so implementation requirements are minimal. The unit does require a compressed air supply of 30 psi maximum.

3.3 Benefits

- Reduce procurement of new antifreeze.
- Eliminate disposal costs of used antifreeze.
- Provide a healthier work environment through use of a closed-loop system, which eliminates operator exposure to antifreeze.

4.0 DATA ANALYSIS

Data was collected from September 1995 to July 1996 based on the Operational Test Plan.

4.1 Quantitative Analysis

Compared with the old method of disposing of used antifreeze after its required service schedule, the Model ARS-18 glycol recycler has a return on investment (per 10-year period) of $20,888.31. The break-even point is 0.98 years. See Cost Analysis for complete data.

4.2 Qualitative Analysis

4.2.1 Installation

The Model ARS-18 glycol recycler is a portable unit that requires an air supply of 30 psi. The unit was delivered to AIMD Mayport in February 1995, but data collection did not begin until September 1995 because of the support equipment maintenance schedule.

4.2.2 Training

A demonstration and hands-on training were provided to determine suitable connections for the procedure providing the best results (*e.g.,* a reverse flow adapter is required for certain items of support equipment).

4.2.3 Maintainability

When servicing a unit, either a glyclean extender solution or small amounts of antifreeze may need to be added to adjust the freeze point of the recycled coolant. The replacement antifreeze can still be obtained through base HAZMAT supply but at a considerably reduced rate and cost.

The recycler unit requires replacement of the filters and periodic cleaning of a debris filter screen. AIMD Mayport currently has enough replacement filters to last at least another year. In addition, AIMD Mayport has an ample supply of glyclean extender solution. Both the filters and extender solution can be obtained locally from Florida Detroit Diesel in Jacksonville through an open purchase.

A pH pen is needed to test the pH of the recycled antifreeze. The pen operates on standard batteries, and a 10.0 pH buffer solution is used to calibrate the pen. As a backup method, pH paper can be used to test the pH. There is an ample supply of the pH litmus-indicating paper with color charts. The buffer solution, pen batteries, and pH paper can currently be obtained from Florida Detroit Diesel through open purchase. In the future, these items should be available through the Navy supply system.

4.2.4 Interface with Site Operations

Currently, AIMD Mayport has 30 different end items of support equipment with cooling system capacities ranging from 3.25 to 15 gallons. The glycol recycler can service each of these—thereby greatly reducing the quantity of antifreeze to be disposed of as hazardous waste and providing significant cost savings by reducing the quantity of new antifreeze purchased.

There are different methods for connecting the support equipment cooling systems to the recycler. The most basic method is using the “T” fitting supplied with the recycling unit to process the antifreeze in the closed-loop cycle. An additional cross-flow adapter was purchased for units that are not compatible with the “T” fitting. For units that are not compatible with the “T” fitting or the cross-flow adapter, the closed-loop flushing process can be bypassed. Instead, the unit is drained and coolant poured into the Model ARS-18 glycol recycler tank, where it is recycled and returned to the unit.

4.2.5 Overall Performance

According to AIMD Mayport personnel, the Model ARS-18 glycol recycler has been an outstanding unit. The only negative feedback during the 1-year test period concerned obtaining consumables used with the unit. This problem was addressed by providing additional consumables to AIMD Mayport.

Overall, the performance of the unit has been excellent. It is easy to use and maintain and also provides cost savings by greatly reducing the amount of fluid waste eliminated and the consumption of new antifreeze.

5.0 LESSONS LEARNED

- Implement an easier method to obtain necessary consumables used with the unit (*e.g.*, make them available through the Navy supply system).

- Analyze equipment to be used with the Model ARS-18 glycol recycler to determine the appropriate method of recycling (*i.e.*, use “T” fitting supplied or optional inexpensive adapters). As a third alternative, drain the units first and then recycle the fluid in the 18 gallon tank. However, this does not take advantage of the closed-loop process and exposes the operator to the antifreeze.

6.0 CONCLUSIONS

The Model ARS-18 glycol recycler provides many benefits to the end user and environment:

- Reduce the amount of used antifreeze going into the wastestream and associated disposal costs.

- Provide major cost savings by reducing the amount of antifreeze consumed and procured.

The results of this study indicate that the glycol recycler is an excellent system for any Navy facility that currently disposes of used antifreeze from different support equipment into its wastestream.

PREPRODUCTION INITIATIVE-NELP
HELICOPTER TRANSMISSION FLUID PURIFICATION UNIT
GENERAL DESCRIPTION

P2 Opportunity: Reduce the quantity of helicopter transmission fluid that must be disposed of as hazardous waste.

Equipment Description: A fluid purification system that removes water, dirt, and other contaminants from used transmission fluid removed from helicopters. The system does not affect the fluid properties so the fluid can be recycled back into the aircraft.

Implementation Requirements: TBD

Benefits:

- Reduce quantity and cost of fluid disposal.
- Reduce requirement for procurement of new fluid.

Other Information: TBD

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Vendor(s): TBD

FY/Site(s): 1997 NELP Initiative, NS Mayport

Cost: $30,000 estimate (1 unit)

PREPRODUCTION INITIATIVE-NELP
HIGH-PRESSURE WATER JET SYSTEM
GENERAL DESCRIPTION

P2 Opportunity: Minimize waste, reduce labor, and provide a safer way to remove paint, corrosion, and marine growth from underwater mines of various configurations. Replace the use of dry blast media (*e.g.*, garnet grit, glass beads, sand, black diamond) with ultra-high-pressure water.

Equipment Description: The high-pressure water jet system uses automated equipment to blast cylindrical mines as well as equipment to manually blast and manipulate mines of spherical and other shapes. The unit uses up to 36,000 psi UHP water blasting capabilities and has a closed-loop wastewater filtration system to separate waste matter and lead from water—thereby decreasing the volume of waste to be disposed.

Implementation Requirements:

- Space requirements: 20' x 30' area for intensifier pump and filtration system; 30' x 30' area for operator controls and cleaning cell
- Electric: 460V, 150 A, 3 phase (for intensifier pump); 230V, 25 A, 3 phase (for closed-loop wastewater filtration system); 480V, 60 Hz, 3 phase (for clamshell cabinet)
- Water: 6 gpm at 40 psi, temperature of 70^{o}F

Benefits:

- Reduce labor for cleaning parts.
- Replace the use of dry blast media with water—thereby eliminating inventory costs and storage problems.
- Save costs in labor, handling, and disposal of hazardous waste.
- Reduce quantity and toxicity of wastestream.
- Provide healthier work environment.
- Provide more operator control to prevent mine damage.
- Resolve EPA air quality concerns associated with dry blasting equipment by eliminating breathable dusts.

Other Information: The system is currently being assessed for the following: complete and uniform stripping, successful removal of contaminants from wastewater, corrosion resistance, cycle time per mine, and effectiveness of the manual and automated stripping processes.

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Vendor(s): Jet-Edge — Model: N/A

	Abrasive Blast Systems, Inc.
FY/Site(s):	1995 NELP Initiative, MOMAU 11, Charleston, SC
Cost:	$339,842 (1 system, including partial vendor installation and approximately $11,000 for repair work)

PREPRODUCTION INITIATIVE-NELP
HIGH-PRESSURE WATER JET SYSTEM
COST ANALYSIS

PROTOTYPE SITE: MOMAU 11, Charleston, SC

DESCRIPTION: Uses automated equipment to blast cylindrical mines and equipment as well as to manually blast and manipulate spherical and other shaped mines. The unit uses up to 36,000 UHP water blasting capabilities and has a closed-loop wastewater filtration system to separate waste matter from water, thereby decreasing the volume of waste to be disposed of.

DATA COLLECTION PERIOD: October 1995 - June 1996 (Interim System)
January 1997 - May 1997 (Final Turnkey System)

COST SAVINGS: The site previously used dry blast media (sand) to strip paint and corrosion from mine surfaces. The site used an interim setup of the UHP depainting/cleaning system for approximately 4 to 5 months. The final turnkey system—which includes a clamshell cabinet for automated, enclosed blasting—has been implemented. These interim and final turnkey systems are nearly identical in yearly costs for waste disposal and consumables, but the labor is decreased using the final turnkey system. The automation of the blasting process increases mine throughput.

PREVIOUS METHOD: Sand Blasting

Initial Setup

Cost of upgrading facility to meet environmental and health and safety requirements as a sandblasting operation: $50,000.00

Consumables

Cost of sand blast media per bag: $42.00
Number of bags used per 35 mines: 6
Number of bags per mine: 0.17
Number of mines per year: 1,440
Cost per year: $10,282.60

Labor

E-3 labor rate per hour: $10.39
Average processing time per mine: 45 minutes
Number of mines processed per day: 6 (assumed)
Processing time per day: 4.5 hours
Hours of blasting per month: 90
Hours of blasting per year: 1,080
Number of mines processed per year: 1,440
Cost per year: $11,221.20

Waste Disposal

Barrels of sand blast media waste generated per week: 1
Pounds per barrel: 1,000
Pounds per month: 4,000
Cost per pound: $5.60
Cost per month: $22,400.00
Cost per year: $268,800.00

Total Annual Cost

Item	Cost
Consumables	$10,282.60
Labor	11,221.20
Waste Disposal	268,800.00
Total	$290,303.80

NELP METHOD: UHP Depainting/Cleaning System

Consumables

Cost per pound of LeadSorb media: $37.05
Pounds used per year: 240
Cost of LeadSorb media per year: $8,892.00

Cost per pound of carbon and coconut hulls: $2.56
Pounds used per year: 220
Cost of carbon and coconut hulls per year: $563.20

Cost per 20 micron filter bags: $8.00
Filter bags used per year: 5
Cost of 20 micron filter bags per year: $40.00

Cost for 25 pounds of Diatomaceous Earth powder: $20.00

Cost per Diatomaceous Earth filter: $307.80
Diatomaceous Earth filters used per year: 2
Cost of Diatomaceous Earth filters per year: $615.60

Cost for 80 gallon hydraulic fluid replacement: $270.00
Number of hydraulic fluid replacements per year: 2
Cost for hydraulic fluid replacements per year: $540.00

Cost for hydraulic breather filler per year: $39.00

Cost per hydraulic fluid filter: $145.00
Hydraulic fluid filters used per year: 5
Cost of hydraulic fluid filters per year: $725.00

Total annual cost for consumables: $11,434.80

Labor

E-3 labor rate per hour: $10.39
Average processing time per mine: 32 minutes
Number of mines processed per day: 6 (assumed)
Processing time per day: 3.21 hours
Hours of blasting per month: 64.25
Hours of blasting per year: 771
Number of mines processed per year: 1,440
Cost per year: $8,011.00

Waste Disposal

No disposal costs incurred to date. The wastewater processing system filters will require replacement once per year. Costs for disposal of the filter elements are projected as follows:

LeadSorb Media	240 lbs x $5.60/lb = $1,344.00
Granular Activated Carbon	220 lbs x $5.60/lb = $1,232.00
Diatomaceous Earth	25 lbs x $5.60/lb = $140.00
Spent Filter Bags	10 lbs x $5.60/lb = $56.00
Spent Hydraulic Fluid	160 gals x 8.3 lb/gal x $5.60/lb = $7436.80

The heavy metals removed from the wastewater include lead, cadmium, titanium, mercury, and iron.

Test data has shown that approximately one-third of a 55 gallon drum of sludge was produced from the blasting of 178 mines. The sludge is assumed to have a density of 30% water (manufacturer's data). If the waste was found to be hazardous, the cost would be as follows:

1,440 mines/year x 18.3 gals sludge/178 mines = 148 gals sludge/year
148 gals sludge x 8.33 lb/gal x 0.30 (moisture content) = 370 lbs sludge/year
370 lbs x $5.60/lb = $2,072.00

Note: In theory, the sludge will not be hazardous because the filter media should remove the heavy metals above.

Total Annual Costs

Item	**Cost**
Consumables	$11,434.80
Labor	8,011.00
Waste Disposal	12,280.80
Total	$31,726.60

COST ANALYSIS SUMMARY (PER YEAR)

Initial Dry Sand Blasting Cost	$50,000.00
Annual Dry Sand Blasting Cost	$290,303.00
Annual UHP Depainting/Cleaning System Cost	$31,726.60
Cost Change	$258,576.40
Initial Procurement	$353,333.00
Expected Service Life	10 years
Return on Investment (per 10-year period)	$2,282,431.00 [50,000 + (10 x $290,303.00)] - [$353,333.00 + (10 x 31,726.60)]
Break Even	1.37 years [$353,333.00/$258,576.40]

PREPRODUCTION INITIATIVE-NELP
HIGH-PRESSURE WATER JET SYSTEM
TEST PLAN

1.0 OBJECTIVE

This test plan describes the data collection procedure for the high-pressure water jet system. The data will be used to determine the efficiency, effectiveness, overall performance of the unit, and the unit's ability to interface successfully with site operations.

2.0 DESCRIPTION

The high-pressure water jet system is designed to remove paint, corrosion, and marine growth from mines of various configurations. The system uses automated equipment for the blasting of cylindrical mines and equipment for manual blasting and manipulation of mines that are spherical, cubical, and other shapes. The unit uses high-pressure water in place of dry blast media (*e.g.*, garnet grit, walnut, glass beads, sand, and black diamond).

3.0 TEST PLAN

The high-pressure water jet system should be operated according to manufacturer instructions. The mines should be carefully inspected both before and after blasting to determine blasting effectiveness and whether damage is being caused to the mines.

3.1 Approach

Quantitative and qualitative data will be acquired by completion of Table 1.

3.1.1 Instructions for Completing Table 1

- **Date:** Indicate dates the unit was used.
- **Contaminants Removed:** Note whether the mine surface was covered primarily with paint, corrosion, or marine growth. If paint was removed, record whether the paint was lead-based.
- **Use of Unit**
  - **Type:** Record the type or part number of the mine.
  - **Quantity:** Indicate the total quantity of mines of this type processed on a given day.
- **Consumables Used:** Record the type, number, and cost of consumables used.
- **Consumables Ordered:** Record the type, number, and cost of consumables ordered.
- **Time/Task:** Record the time per unit task (*i.e.*, the cycle time per mine).

- **Downtime/Month**

  - **Time Period:** Record periods when the unit was not in use.

  - **Reason:** Explain whether downtime was due to repairs, maintenance, workload, or other reasons.

- **Qualitative Assessment:** Provide a narrative evaluation of the abilities of the high-pressure water jet system. Briefly discuss:

  - Efficiency of the unit (*e.g.*, time and cost savings)

  - Ease of use and the unit's ability to successfully interface with the other site mine cleaning, refurbishment, and repainting operations. Please discuss any interference caused by the unit (*e.g.*, such as excessive noise, steam output) to other operations taking place in the vicinity of the system.

  - Safety of the unit for operators

  - Environmental concerns—including waste disposal costs, logistical problems with waste disposal, ability to separate liquid from waste, etc.

  - Overall satisfaction with the surface preparation of the mines. Please compare to the cleanliness of mines processed by former methods.

3.1.2 Instructions for Completing Table 2

- **Date:** Record dates the unit was used.

- **Presence of the Following (Manual Cleaning):** Indicate "yes" or "no" in the appropriate column regarding whether any of the following characteristics are present. If "yes," list the specific mines that had evidence of these deficiencies and the locations of those deficiencies in the qualitative assessment section.

  - Mine flange damage
  - Surface damage
  - Incomplete or non-uniform stripping

- **Presence of the Following (Automatic Cleaning Unit):** Indicate "yes" or "no" in the appropriate column as to whether any of the following characteristics are present. If "yes," list the specific mines that had evidence of these deficiencies and the locations of those deficiencies in the qualitative assessment section.

  - Mine flange damage
  - Surface damage
  - Incomplete or non-uniform stripping

- **Mine Damage:** Indicate whether new damage was caused or any existing damage was worsened by the high-pressure water jet system.

- **Interior Corrosion of Unit:** Based on visual observation, indicate “yes” or “no” regarding whether there is interior corrosion of the unit. Note the exact location and size (area) of the corrosion.

- **Leakage of Unit:** Based on visual observation, please indicate “yes” or “no” regarding whether there is leakage of the unit. Note the exact location and approximate amount of leakage.

- **Qualitative Assessment:** Include specific details on any of the above sections marked “yes.”

4.0 REPORTING

The data entry forms are a concise method of data collection. Forms should be completed on a daily basis. Data will be collected for 1 year. During this time, monthly status reports on the testing will be submitted to the following:

Naval Air Warfare Center
Aircraft Division Lakehurst
Route 547 South
M/S 482500B562-3
Lakehurst, NJ 08733
Attn: C. S. Mahendra

UTRS, Inc.
950 North Kings Highway
Suite 208
Cherry Hill, NJ 08034
Attn: Environmental Program Manager

The final report will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations.

Table 1

Date	Contaminants Removed			Use of Unit		Consumables Used			Consumables Ordered			Time/Task	Downtime/Month	
	Paint	Corrosion	Marine Growth	Type	Quantity	Type	No.	Cost	Type	No.	Cost		Time Period	Reason

Qualitative Assessment*:
Please comment on the effectiveness and efficiency of the unit.

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*Attach extra sheet if required.

Table 2

Date	Presence of the Following (Manual Cleaning Unit)			Presence of the Following (Automatic Cleaning Unit)			Mine Damage	Interior Corrosion	Leakage
	Flange Damage	Surface Damage	Incomplete or Non-Uniform Stripping	Flange Damage	Surface Damage	Incomplete or Non-Uniform Stripping			

Qualitative Assessment*:
Provide details on any question answered “yes.”

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*Attach extra sheet if required.

PREPRODUCTION INITIATIVE-NELP
HYDRAULIC PURIFIER—HII
GENERAL DESCRIPTION

P2 Opportunity: Extend the use of aircraft hydraulic fluids—MIL-H-46170 and MIL-H-83282—applicable to aircraft and ground support equipment (SE).

Equipment Description: The Hydraulics International, Inc. fluid purifier is a small, portable, electrically powered, ground support system designed to maintain fluid cleanliness. It removes particulate, water, air, and chlorinated solvent contamination using 3-micron absolute filters, water adsorption filters, air desiccant filters, and a low vacuum. The purifier does not alter the physical or chemical properties of the reconditioned fluid. The unit is mounted on four casters with wheel brakes to facilitate moving for maintenance. Unit is supplied with a Class "L" MS90556 type straight plug connector.

Implementation Requirements:

- Electrical: 220/440V, 60 Hz , 3 phase
- Size: 43" high x 34" wide x 29" long, 400 lbs dry
- Maximum Flow Rate: 5 gpm
- Inlet Port: Aeroquip quick disconnect, P/N TA155-S4-16D
- Outlet Port: Aeroquip quick disconnect, P/N TA155-S4-20D

Benefits:

- Reduce quantity and cost of fluid disposal.
- Reduce requirement for procurement of new fluid.

Other Information: Tailor interfaces to fluid reservoirs on or off SE as required

Procuring Activity Manager: Jill MacIntyre, 1.1.X.7.1.J.B — Tel: (908) 323-1936
Naval Air Warfare Center, Aircraft Division
Lakehurst, NJ

Technical Activity POC: Joseph Cruz, 4.8.2.5 — Tel: (908) 323-2966

Vendor(s): Hydraulics International, Inc. — Model: HPU-1-5

FY/Site(s): 1994 NELP Initiative, NAS North Island, NS Mayport

Cost: $21,506 (2 units)

PREPRODUCTION INITIATIVE-NELP
HYDRAULIC PURIFIER—PALL
GENERAL DESCRIPTION

P2 Opportunity: Extend the use of aircraft hydraulic fluids—MIL-H-46170 and MIL-H-83282—applicable to aircraft and ground support equipment (SE).

Equipment Description: The PALL hydraulic purifier is a small, portable, electrically powered, ground support system designed to automatically maintain fluid cleanliness. It removes particulate, water, air, and chlorinated solvent contamination without desiccants, high vacuum, or high heat. Hence, it does not alter the physical or chemical properties of the reconditioned fluid.

Implementation Requirements:

- Electrical: 120V, 15 A, 60 Hz, 1 phase, 20 kW maximum
- Inlet: 16 (hose per SAE 100R4)
- Outlet: 12 (hose per SAE 100R4)
- Size: 34" high x 25.7" wide x 34" long, 350 lbs dry
- Maximum Flow Rate: 3 gpm
- Cycle Capacity: Continuous

Benefits:

- Reduce quantity and cost of fluid disposal.
- Reduce requirement for procurement of new fluid.

Other Information: Tailor interfaces to fluid reservoirs on or off SE as required

Procuring Activity Manager: Jill MacIntyre, 1.1.X.7.1.J.B — Tel: (908) 323-1936
Naval Air Warfare Center, Aircraft Division
Lakehurst, NJ

Technical Activity POC: Joseph Cruz, 4.8.2.5 — Tel: (908) 323-2966

Vendor(s): PALL Aeropower Corporation — Model: PE-00440-1H
Pall Land and Marine

FY/Site(s): 1994 NELP Initiative, NAS North Island, NS Mayport

Cost: $28,472 (2 units)

PREPRODUCTION INITIATIVE-NELP
HYDRAULIC PURIFIER
COST ANALYSIS

PROTOTYPE SITES: NAS North Island, NS Mayport

DESCRIPTION: Reconditions aircraft hydraulic fluids MIL-H-46170 and MIL-H-83282 for reuse in ground support equipment (GSE). Currently, no equipment in service at Navy activities is capable of reconditioning (cleaning) aircraft hydraulic fluid to Navy standard class 3 for reuse in GSE. Both systems defined here have cleaned fluid to Navy standard class 1. Because the maintenance on hydraulic fluid is "as required," the costs are presented on the basis of individual fluid changeouts.

DATA COLLECTION PERIOD: June 1995 - February 1996

COST SAVINGS: These units will minimize the quantity of used hydraulic fluid that must be disposed of and procurement of new hydraulic fluid.

PREVIOUS METHOD: Disposal of Waste Fluid

Consumables

Gallons of hydraulic fluid MIL-H-83282 required for A/M27T-5: 17
(It is estimated that 15 gallons are in reservoir and 2 gallons are in lines and filters. An equal amount of fluid is required for a system purge, which doubles the total quantity. Thus, 34 gallons would be required for a system purge.)
Gallons of hydraulic fluid MIL-H-83282 required for system purge: 34
Cost per gallon: $8.90
Cost per system purge: $302.60
Cost per filter: $69.00
Cost per changeout: $435.00
Total cost (system purge, filter, and changeout): $806.60

Labor

E-3 labor rate per hour: $10.39
Hours per test: 2
Cost per test: $20.78

Waste Disposal

Gallons of waste hydraulic fluid: 34
Pounds per gallon: 6.5
Cost per pound: $2.10
Cost of rags: Not included
Total cost: $464.10

Cost per Disposal Cycle

Item	Cost
Consumables	$806.60
Labor	20.78
Waste Disposal	464.10
Total	$1,291.48

NELP METHOD: Hydraulic Purifier System

Consumables

Filters for HPU-1-5
Cost for two MIL-F-81836 filters: $870.00
Cost for two 62620-100 filters: $300.30
Cost for two LE-10AZ filters: $134.20
Total cost for filters: $1,304.50
Gallons to be processed: 3,000
Cost per gallon ($1304.50/3000): $.435
Cost of 15 gallons: $6.53
Cost of T-5 new filters: $69.00
Cost per changeout: $435
Rags: Not included
Cost (15 gallons, T-5 new filters, and changeout): $510.53

Labor

E-3 labor rate per hour: $10.39
Time for system hookup-shutdown: 1 hours
Cost for system hookup-shutdown: $10.39

Waste Disposal

Estimated pounds of used filters: 10
Cost per pound: $2.10
Cost for used filters: $21.00
Rags: Not included

Cost per Purifier Cycle

Item	Cost
Consumables	$510.53
Labor	10.39
Waste Disposal	21.00
Total	$541.92

COST ANALYSIS SUMMARY

Disposal of Waste Fluid per Cycle	$1,291.48
Hydraulic Purifier System per Cycle	$541.92
Cost Change per Cycle	$749.56
Initial Procurement *(cost of hydraulic purifier under current contract)*	$8,479.00
Expected Service Life	10 years
Return on Investment (per 10-year period) *(assume 6 Changeouts/ year)*	$36,494.60 [(10 x 6 x $1,291.48)-($8479.00 + (10 x $541.92 x 6))]
Break Even	1.89 years [$8,479/(6 x $749.56)]

PREPRODUCTION INITIATIVE-NELP
HYDRAULIC PURIFIER
TEST PLAN

1.0 OBJECTIVE

This test plan describes the data collection procedures for acquiring performance data on two hydraulic purifier models located at the Aircraft Intermediate Maintenance Department (AIMD) activity at NS Mayport, Florida and NAS North Island, California. These data will be used to determine the efficiency, effectiveness, and overall success of the purifiers regarding their ability to recondition contaminated hydraulic fluid to levels considered acceptable for use in support equipment and aircraft hydraulic systems.

2.0 DESCRIPTION

Aircraft hydraulic fluids contaminated beyond the acceptable limits defined by Navy Standard Class 5 are currently disposed of as hazardous waste. The amount of hydraulic fluid that is considered hazardous waste can be significantly reduced if particle contamination levels are lowered to at least the levels of Navy Standard Class 3 and other contaminants are removed or significantly reduced.

Contaminated synthetic aircraft hydraulic fluids MIL-H-46170 (Hydraulic Fluid, Rust-Inhibited, Fire-Resistant) and MIL-H-83282 (Hydraulic Fluid, Fire-Resistant), when reconditioned, shall meet or exceed the following contamination levels to be acceptable for reuse:

- Reduction of particulate concentrations to at least Navy Standard Class 3
- Removal of 100% of free/entrained water
- Reduction of dissolved water concentration to at least 250 parts per million (ppm)
- Reduction of chlorinated solvent concentration to at least 100 ppm

3.0 TEST PLAN

This test plan will be used to evaluate the effectiveness of two hydraulic purifier systems—HPU-1-5, which is manufactured by Hydraulic International, Inc., and PE-00440-1H, which is manufactured by PALL Land and Marine Corporation. These systems are being evaluated for their ability to recondition aircraft hydraulic fluid to meet the parameters listed in Section 2.0.

3.1 Approach

The HPU-1-5 hydraulic purifier will be used in conjunction with the A/M27T-5 hydraulic power supply to recondition (*i.e.*, purify) aircraft hydraulic fluid, MIL-H-83282, within the T-5 system. Hose assemblies and appropriate components interconnect the purifier and hydraulic power supply to enable fluid to be processed directly from the fluid reservoir. Fluid samples will be drawn from a sample port within the system and analyzed to determine the levels of contamination.

This test plan also applies to MIL-H-46170 hydraulic fluid using the PALL hydraulic purifier. However, a fluid reservoir with appropriate connections will have to be devised to interface with the existing hose components. Suggestions for a fluid reservoir are presented herein.

Reconditioning and maintenance data will be collected for 1 year. These data will be periodically analyzed to monitor the feasibility of the reconditioning process.

3.1.1 Requirements

- **Particle Counter:** The particle counter shall be within its calibration cycle.

- **Fluid Sample Bottle:** The following containers are acceptable for fluid collection.

  - **Flint Glass Bottle:** National Stock Number (NSN) 8123-00-543-7699
  - **Plastic Sample Bottle:** Part Number (P/N) XX6504709 (from Contamination Analysis Kit, P/N 57L414).

CAUTION: The plastic bottle shall not be used if the sample will be stored for more than 24 hours.

- **Hydraulic Purifier:** The hydraulic purifier shall only be operated by qualified personnel.

- **Hydraulic Hose Interface Connections to the T-5:** The connections shall be in general accordance with supplied figures.

- **Safety:** Caution shall be exercised in the application of the hydraulic purifier. Refer to the warnings and cautions in the purifier technical manuals. However, do not:

  - Combine hydraulic fluids formulated to different specifications (*e.g.*, MIL-H-83282 and MIL-H-46170).
  - Combine fluids of different types within the same specification (*e.g.*, MIL-H-46170, Types I and II).
  - Introduce flammable or explosive solvents or fluids of any type.
  - Apply pressurized air to the purifier intake.
  - Change sampling points during the purification process.

3.1.2 Procedures

The following procedures describe methods for acquiring fluid test samples from a sample port. These samples will be evaluated to determine the performance of the hydraulic purifiers relative to reducing fluid contamination to levels that render the fluid acceptable for reuse in ground support equipment.

3.1.2.1 A/M27T-5 Reservoir

1. Interconnect the hydraulic supply as described in Section 4.0. Ensure that the reservoir sump is drained of water, the hydraulic fluid reservoir is filled to capacity, and all applicable hydraulic connectors have been cleaned and connected. Establish the fitting to be used as a sampling port.

2. Prepare the sample port, as follows.

   a. Remove dirt and other external contaminants by washing it with cleaning solvent P-D-680, Type II. The solvent shall be dispensed from a nonfiltered wash bottle, and the sampling point shall be wiped clean using disposable wiping cloths.

   b. When the sampling port is visibly clean and free of external contaminants, perform a final solvent wash using the wash bottle and allow it to dry.

3. Recirculate the fluid for at least 5 minutes at full flow (or proportionally longer at a lower flow rate) before sampling the support equipment hydraulic system fluid.

4. Collect a fluid sample, as follows.

   a. Drain the sample bottle of any hydraulic fluid remaining from the previous sample or use a new sample bottle. ***Do not rinse*** the sample bottle with solvent.

   b. Initiate the flow of hydraulic fluid from the sampling port of the hydraulic supply and allow a purge quantity of approximately five times the stagnant volume to flow into a waste receptacle.

   c. Rinse the sample bottle with system fluid. After purging the dead volume, fill it half-full with fluid collected from the sampling port. Cap the bottle and shake it for at least 1 minute. Drain the bottle into the waste receptacle.

   d. Without interrupting the fluid flow from the sampling port, fill the rinsed sample bottle to an appropriate level, remove from the fluid stream, and cap.

      – **Fluid Level for Flint Glass Bottle:** Approximately 1 inch (25 mm) below the shoulder
      – **Fluid Level for Plastic Bottle:** Approximately 1/4 inch (6 mm) below the shoulder

e. Terminate the fluid flow from the sampling port.

f. Turn off the power supply system main engine.

g. Set the reservoir selector valve to Test Stand Reservoir to connect the fluid reservoir to the power supply hydraulic system (Reference: NAVAIR 17-15BF-89, WP003 00, page 15, index number 4). This allows fluid circulation between the suction return port and the reservoir drain of the T-5.

h. Analyze the hydraulic fluid drawn from the sample port for the following and enter the results on the data sheet:

   - **Particulate Concentrations:** Navy Standard Class
   - **Free/Entrained Water Concentration:** ppm
   - **Dissolved Water Concentration:** ppm
   - **Chlorinated Solvent Concentration:** ppm

i. Complete the appropriate sections of the Hydraulic Purifier Performance Data Form.

CAUTION: Due to the sensitivity of the particle counters, it is imperative to have clean fluid samples. The following observations are to be made.

- Sampling port shall be clean.
- Sampling port shall be purged to remove stagnant fluid.
- Sample bottle shall be rinsed with fluid from the sample port after purging stagnant fluid.
- Sampling flow shall be continuous—from the purging through the filling of the sample bottle—after which it will be discontinued.
- Only one sampling point shall be used during the purification process.

NOTE: Sampling ports and bottles that are insufficiently cleaned will result in erroneous data. This will result in the fluid failing the test and additional purification time and labor.

5. Initiate operation of the purifier. The purifier start-up and operation should be conducted in conformance with the procedures outlined in the operations manual and the directions received during training. This cycle time may increase at high ambient temperatures and/or humidity to drive off dissolved water.

6. Repeat steps 2, 3, and 4.

7. If the following levels are not accomplished, repeat steps 5 and 6.

   - **Particulate Concentrations:** Navy Standard Class 3 minimum
   - **Free/Entrained Water:** 0 ppm
   - **Dissolved Water Concentration:** 250 ppm maximum

– **Chlorinated Solvent Concentration:** 100 ppm maximum

8. Complete the appropriate sections of the Hydraulic Purifier Performance Data Form.

3.1.2.2 Reservoir Other Than T-5

1. Interconnect the purifier hydraulic supply and return the lines to the reservoir provided for the MIL-H-46170 hydraulic fluid (see paragraph 4.4). Ensure that the reservoir sump is drained of water, the hydraulic fluid reservoir is filled to capacity (suggested 15 gallon minimum), and all applicable hydraulic connectors have been cleaned and connected. Establish the fittings to be used for the sampling port.

2. Perform step 2 in paragraph 3.1.2.1.

3. Collect the fluid sample. Ensure that the reservoir has ample fluid agitation throughout the reconditioning process.

4. Repeat steps 4 through 7 in paragraph 3.1.2.1, as applicable.

3.1.3 Instructions for Completing Hydraulic Purifier Performance Data Form

- **Reference Number:** Indicate the reference line number

- **Date:** Indicate the date the reconditioning process was accomplished (month/day/year).

- **Particle Counter Instrument:** Indicate the instrument (*e.g.,* HYAC/ROYCO 8011 or Diagnetics DCA) used to measure the particulate concentrations. The technician must verify that the instrument is within its calibration cycle.

- **Relative Humidity (%):** Indicate the average relative humidity recorded at the naval station during the reconditioning process.

- **Temperature:** Record the average temperature of the hydraulic fluid during the reconditioning process.

- **Quantity (Gallons):** Record the number of gallons of hydraulic fluid processed.

- **Hydraulic Supply:** Indicate the hydraulic supply from which the fluid was processed (*e.g.,* A/M27T-5 or other reservoir) by entering the system identifying number. Agitation of the mixture will be accomplished by fluid recirculation set up within the tank/reservoir during reconditioning. (Drain the hydraulic fluid from the supply/reservoir sump to remove free water. Decant the drained solution; return the fluid to the reservoir for reconditioning; and dispose of the water in the proper manner.)

- **Initial Fluid Contamination:** Before processing the fluid, record the following data in the spaces indicated.
  - **Particulate Concentration (Navy Standard Class):** Indicate the Navy Standard Class that defines the particle distribution measurement obtained for the unprocessed fluid.
  - **Free/Entrained Water Concentration:** Indicate the amount (in ppm) of free/entrained water. (Use Karl Fischer reagent or an equivalent method to obtain the data.)
  - **Dissolved Water Concentration:** Indicate the amount (in ppm) of dissolved water. (Use Karl Fischer reagent or an equivalent method to obtain the data.)
  - **Chlorinated Solvent Concentration:** Indicate the amount (in ppm) of chlorinated solvent contamination. (It is recommended that an outside source be used for analysis.)
- **Purification Time:** Indicate the start and finish time of the fluid reconditioning process.
- **Final Fluid Contamination:** After processing the fluid, record the following data in the spaces indicated.
  - **Particulate Concentration (Navy Standard Class):** Indicate the Navy Standard Class that defines the particle distribution measurement obtained for the processed fluid.
  - **Free/Entrained Water Concentration:** Indicate the amount (in ppm) of free/entrained water. (Use Karl Fischer reagent or an equivalent method to obtain the data.)
  - **Dissolved Water Concentration:** Indicate the amount (in ppm) of dissolved water. (Use Karl Fischer reagent or an equivalent method to obtain the data.)
  - **Chlorinated Solvent Concentration:** Indicate the amount (in ppm) of chlorinated solvent contamination. (It is recommended that an outside source be used for analysis.)
- **Rate/Technician:** Indicate the rate and name of the cognizant individual for fluid processing and data entry.
- **Qualitative Assessment:** Provide a narrative evaluation of the unit's performance. Briefly discusses:
  - Efficiency of the method (*e.g.*, time and cost savings)

– Ease of use and the unit’s ability to successfully interface with site operations.

3.1.4 Instructions for Completing Filter Replacement Tracking Form

- **Reference Number:** Indicate the reference line number.
- **Date:** Indicate the date the filter was changed (month/day/year).
- **Filter Change-Out:** Check the appropriate block to indicate when a filter was changed-out. Check A if the filter was changed after the reconditioning process; check B if the filter was changed before the reconditioning process.

The initial inventory of spare filters received with each purifier are based on processing an estimated 500 gallons of hydraulic fluid per month over a 6 month period. However, until fluid reconditioning test data are compiled and analyzed, each filter shall be reordered when it is changed-out in the system. The filters received with each system are as follows.

System	Purifier Filter	Initial Inventory
PALL Aeropower Corporation PE-00440-1H	GC-00273F-168H, Discharge	6
	AA-4463F-1, Coalescing	3
	PA-00440-1A, Air Inlet	4
Hydraulic International, Inc. HPU-1-5	62620-100, Contamination	2
	9927808, Water Separator	2
	LE-10AZ, Water Separator	2

3.1.5 Data Sheets

Copies of the completed data sheets should be forwarded to SEMCOR on a monthly basis. Submittal shall be independent of the amount of fluid processed.

3.1.6 Maintenance Records

Copies of maintenance records—including preventive, repair, and warranty activities (including labor hours and any extended downtime)—should be forwarded to SEMCOR.

4.0 A/M27T-5 HYDRAULIC CONNECTIONS

Fluid reconditioning using the T-5 supply system reservoir eliminates the requirement for off-line equipment, minimizes fluid contamination, and reduces the labor related to fluid reconditioning. The A/M27T-5 system connections for a fluid purifier were recommended by the manufacturer. Interconnecting hose assemblies are essentially fixed to the purifier via NPT threads and coupled to the T-5 with self-sealing quick disconnect fluid couplings.

4.1 Recommended Connections

The recommended connections between the T-5 and the purifier are as follows.

- Purifier Pressure Port (Outlet) to the T-5 Suction Return Port (Reference: NAVAIR 17-15BF-89, 11-1-90, Work Package 003 00, page 17, item number 25)

- Reservoir Drain Valve (1.0 FNPT) of the T-5 Hydraulic Reservoir (Reference: NAVAIR 17-15BF-89, 11-1-90, Work Package 003 00, page 13, index number 2). This valve was recommended as the fluid supply to the purifier inlet port.

4.2 Hose Assembly/Components

The hose assembly/component configurations for the purifier fluid supply (inlet) are the same for both systems and differ only in the fitting required to adapt the hose assembly to the purifier. The HPU-1-5 requires a 1.0 MNPT and the PALL requires a 3/4 MNPT AN816 type adapter.

4.3 Reservoir Drain Adaptation

The AN816 adapter fitting should be installed into the reservoir drain fitting after the fitting's interior is cleaned in accordance with step 2 in paragraph 3.1.2.1. Use appropriate methods for sealing threads when installing the adapter fitting. Once installed, this fitting should remain in place. Normally, this fitting will have the AN929-16 cap assembly installed to prevent the entry of contaminants. It must be removed to drain the reservoir sump or to connect the -16 jumper tubing used to interconnect the quick disconnect, self-sealing hydraulic coupling.

4.4 Reservoir Other Than T-5

The minimum fluid capacity for an off-line reservoir (other than T-5) should be 10 gallons minimum—with provisions for an agitation device (*e.g.,* a commercial stirrer). A tank having a conical bottom with a 1-1/4 NPT port at the apex is desirable for the fluid supply to the purifier. The return flow from the purifier should be located below the fluid level in the reservoir and directed to obtain the best circulation without agitator operation. The sampling port pickup line should be rigid and have its pickup point in the proximity of maximum circulation. Do not use a flexible sampling pickup line. The fluid sample pickup point must be repeatable (*i.e.,* fixed).

The hydraulic fluid hose assembly/components are readily adaptable to reservoirs other than the T-5. Basically, the 1.0 NPT adapter that engaged the T-5 reservoir drain valve can be coupled to the conical bottom of the tank and the -16 self-sealing, quick disconnect coupling can be half-installed as part of the tank assembly.

The fluid return fitting that will be part of the tank assembly should mate with the -20 self-sealing, quick disconnect half-coupling on the hose assembly. Although these parts are available from another manufacturer, delivery is approximately twice as long.

Other than interconnecting an off-line reservoir, all other aspects of hydraulic fluid reconditioning are basically the same as for reconditioning using the A/M27T-5 hydraulic power supply.

5.0 FINAL REPORT

The data entry forms are a concise method of data collection. The forms should be completed on a daily basis. Data will be collected for 1 year. During this time, periodic status reports on the testing will be submitted to NAWCADLKE. The final report will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations.

Hydraulic Purifier Performance Data Form

		Purifier						Initial Fluid Contamination				Purificiation Time		Final Fluid Contamination				
Ref. No.	Date	PALL	HI	Relative Humidity %	Temp.	Qty. (Gal.)	Hydraulic Supply	Particulates (Navy Class)	Free/ Entrained Water	Dissolved Water	Chlorinated Solvent	Start	Finish	Particulates (Navy Class)	Free/ Entrained Water	Dissolved Water	Chlorinated Solvent	Rate/ Tech.

Qualitative Assessment*:
Please comment on the effectiveness and efficiency of the units.

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*Attach extra sheet if required.

Filter Replacement Tracking Form

		Filter Change-Out											
		PALL						HI					
Ref.		GC-00273F-168H		AA-4463F-1		PA-00440F-1A		MIL-F-81836		62620-100		LE-10AZ	
No.	Date	A	B	A	B	A	B	A	B	A	B	A	B

PREPRODUCTION INITIATIVE-NELP
HYDRAULIC PURIFIER
FINAL REPORT

NS MAYPORT, FL AND NAS NORTH ISLAND, CA

1.0 INTRODUCTION

The U.S. Navy has adopted a proactive and progressive position toward protecting the environment and complying with environmental laws and regulations. Rather than merely controlling and treating hazardous waste by end-of-the-pipe measures, the Navy has instituted a program for Pollution Prevention (P2) to reduce or eliminate the volume and toxicity of waste, air emissions, and effluent discharges.

P2 allows the Navy to meet or exceed current and future regulatory mandates and to achieve Navy-established goals for reducing hazardous waste generation and toxic chemical usage. P2 measures are implemented in a manner that maintains Navy readiness. An additional benefit has been a general increase in operational efficiency.

The Navy has truly set the standard for the procurement and implementation of P2 equipment. The Chief of Naval Operations (CNO), Environmental Protection, Safety, and Occupational Health Division (N45), established the P2 Equipment Program, through which both the Naval Air Warfare Center Lakehurst (NAWCADLKE) and the Naval Facilities Engineering Service Center (NFESC) serve as procurement agents under the direction of (N45). P2 equipment is specified and procured under two complementary initiatives, the Preproduction Initiative (*i.e.*, technology demonstration) and the Competitive Procurement Initiative. The Preproduction Initiative directly supports both the Navy Environmental Leadership Program (NELP) for P2 shore applications and the P2 Afloat program, which prototypes and procures P2 equipment specific to the needs of ships.

This report provides an analysis of the procurement, installation, and operation of P2 equipment under the Preproduction Initiative. Technology demonstrations and evaluation were primarily performed under NELP at two designated NELP sites, NAS North Island and NS Mayport. Additional sites have been added as required to meet mission goals. The program involves defining requirements, performing site surveys, procuring and installing equipment, training operators, and collecting data during an operational test period. The equipment is assessed for environmental benefits, labor and costs savings, and ability to interface with site operations.

2.0 BACKGROUND

Maintenance of hydraulic fluid related to the A/M27T-5 aircraft support equipment (SE) is currently accomplished using several methods, including recirculation, purification, flushing, or purging. The method used depends on the degree and type of fluid contamination. The flush and purge method, which is reserved for serious fluid contamination, cleans the hydraulic system and replaces the drained hydraulic oil with new fluid. Removed hydraulic fluid cannot be reinstalled in the system and is disposed of as a hazardous waste.

In view of the Navy's P2 goals, a method to extend the service life of hydraulic fluid is required to reduce the amount of disposable waste oil and new hydraulic oil required for fleet SE. A hydraulic purifier interfaced to the A/M27T-5 fluid reservoir has the potential to reduce contaminants to acceptable levels, which precludes the necessity for flushing and refilling the system. This essentially extends the oil life.

Four commercially available hydraulic purifier systems were reviewed for their application to removing contaminates (purifying) from aircraft hydraulic fluid. Two of these systems—PALL Land and Marine Model PE-00440-1H and Hydraulic International, Inc. Model HPU-1-5—were selected for evaluation because they were considered to have the most potential to support the Navy aircraft hydraulic contamination control program and P2 goals. Each system is capable of reducing fluid particulates to less than Navy Standard Class 3, chlorinated solvents to 100 parts per million (ppm), and dissolved water to 250 ppm while removing 100% of free/entrained water. These systems do not use desiccants, high vacuum, or high heat in the purification processes. Both systems are used at the Aircraft Intermediate Maintenance Department (AIMD) maintenance activities at NAS North Island and NS Mayport. These activities provided the support and data used to evaluate the effectiveness of the equipment.

3.0 EQUIPMENT DESCRIPTION

3.1 Specifications

3.1.1 Hydraulics International, Inc. Model HPU-1-5

The Hydraulics International, Inc. hydraulic purifier is a small, portable, electrically-powered, ground support system designed to maintain fluid cleanliness. It removes particulate, water, air, and chlorinated solvent contamination using 3-micron absolute filters, water adsorption filters, air desiccant filters, and a low vacuum. The purifier does not alter the physical or chemical properties of the reconditioned fluid. The unit is mounted on four casters with wheel brakes to facilitate moving for maintenance. The unit is supplied with a Class "L" MS90556 type straight plug connector.

3.1.2 PALL Model PE-00440-1H

The PALL hydraulic purifier is a small, portable, electrically-powered, ground support system designed to automatically maintain fluid cleanliness. It removes particulate, water, air, and chlorinated solvent contamination without desiccants, high vacuum, or high heat. It does not alter the physical or chemical properties of the reconditioned fluid.

3.1 Implementation Requirements

Hydraulic International, Inc. Model HPU-1-5

- Electrical: 220/440V, 60 Hz , 3 phase
- Size: 43" high x 34" wide x 29" long, 400 lb dry
- Maximum flow rate: 5 gpm
- Inlet port: Aeroquip quick disconnect, P/N TA155-S4-16D
- Outlet port: Aeroquip quick disconnect, P/N TA155-S4-20D

PALL Model PE-00440-1H

- Electrical: 120V, 15 A, 60 Hz, 1 phase, 20 kW maximum
- Size: 34" high x 25.7" wide x 34" long , 350 lb dry
- Maximum flow rate: 3 gpm
- Inlet: 16 (hose per SAE 100R4)
- Outlet: 12 (hose per SAE 100R4)
- Cycle capacity: Continuous

3.2 Benefits

- Reduce quantity and cost of fluid disposal.
- Reduce procurement requirements for new fluid.
- Improve equipment reliability and performance.
- Reduce labor related to hydraulic fluid maintenance.

4.0 DATA ANALYSIS

Data was collected monthly through January 1996 at NS Mayport and February 1996 at NAS North Island in accordance with the Operational Test Plan. Each site received one HPU-1-5 unit and one PE-00440-1H unit.

The original plan was to collect performance data from the date the systems were installed and training was completed. However, problems interfacing the system to SE and site utilities created delays. Although the data is not as complete as desired, it is sufficient to support the conclusions and recommendations of this report.

CHRONOLOGY

System	Delivery Date	Training Date	Warranty Expiration Date
NS Mayport			
PALL PE-00440-1H	3 February 1995	30 November 1995	9 February 1996
HII HPU-1-5	3 February 1995	3 August 1995	9 February 1996
NAS North Island			
PALL PE-00440-1H	27 January 1995	7 June 1995	1 February 1996
HII HPU-1-5	24 January 1995	17 March 1995	1 February 1996

4.1 Quantitative Analyses

Test data is summarized below and represents the minimum number of gallons of hydraulic fluid processed by each AIMD.

System	Site	Usage	Total Gallons	Reservoir Interface
PE-00440-1H	NS Mayport	6 times	18	P/N 636AS100-1
	NAS North Island	10 times	200	A/M27T-5
HPU-1-5	NS Mayport	Training	20	A/M27T-5
	NAS North Island	1 time	40	55-gallon drum (contaminated with P-D-680)

The system has a return on investment (per 10-year period) of $39,494.60. The break-even point is 1.89 years. See Cost Analysis for complete data.

4.2 Qualitative Analysis

Based on comments provided on the data sheets, the operational performance of each system is considered satisfactory for its intended use. In fact, the systems are applicable to fluids other than hydraulic oils, as noted in the equipment manuals. To use the system for other fluids, it must first be purged to clean out the previously processed fluid and new filters must be installed.

4.2.1 Installation

Interface problems between the system and site utilities created installation delays.

4.2.2 Training

Training on use of the equipment was conducted on site by the manufacturer's representative. The site activities reported that the training sessions were satisfactory.

4.2.3 Maintainability

The total number of gallons processed through each purifier was too low to arrive at any determination.

4.2.4 Interface with Site Operations

Both purifier systems will remove contaminants from the hydraulic fluid to levels satisfactory for use in SE. However, only particulate levels in the fluid were monitored.

4.2.5 Overall Performance

The usage data were not sufficient to extract reliability information. No downtime was reported for the PALL units; however, usage was very low. The HPU-1-5 units were used only during training sessions.

4.2.5.1 <u>HPU-1-5 System</u>

NAS North Island unsuccessfully attempted to use the HPU-1-5 system in November 1995 to remove P-D-680 from hydraulic fluid. The system has been inoperative since December 1995.

The HPU-1-5 purifier at NS Mayport was used only in training with the A/M27T-5 hydraulic supply. NS Mayport experienced a vacuum problem with the purifier system during training; a full vacuum could not be attained. The system was subsequently repaired under warranty.

4.2.5.2 <u>PE-00440-1H System</u>

The PE-00440-1H units at NAS North Island and NS Mayport have not experienced any reliability problems. However, the total gallon throughput has been very low at NS Mayport because the 633AS100-1 SE has only a 3 gallon reservoir.

5.0 LESSONS LEARNED

- If incorporated in the SE maintenance process, a hydraulic purifier similar to those evaluated under NELP could significantly reduce the volume of waste hydraulic oil resulting from particulate, chlorinated solvent, and/or water contamination.

- The residual hydraulic oil resulting from particle counter measurements can be largely eliminated if the maintenance activity uses a hydraulic purifier and if the oil does not contain contaminants prohibited by the purifier operations/maintenance manual.

- Processing hydraulic fluid in small reservoir-capacity SE by interfacing the purifier directly to the unit is not cost-effective.

- Navy activities will achieve environmental benefits and cost savings by using a hydraulic purifier. This unit will reduce the requirement for new oil and the volume of waste hydraulic oil.

6.0 CONCLUSIONS

The major environmental benefit will be the reduction in the volume of waste hydraulic fluid and a corresponding decrease in the requirement for new fluid. The cost savings realized from purchasing less new oil may be amplified by a reduction in waste oil requiring disposal (*i.e.,* disposal costs at NS Mayport are $2.10 per pound).

Waste reduction depends on the type and degree of contamination and gallons of processed hydraulic fluid using the purifiers. Waste oil drained from SE as a result of purging the system may be a candidate for purification, especially if new fluid is being used as a cleaning agent.

The following actions are recommended:

- Interface the hydraulic purifier with the A/M27T-5 and decontaminate the fluid in the system in lieu of flushing to eliminate the requirement for new oil and waste disposal of drained oil.

- Evaluate and select a portable water test kit to measure the moisture content of hydraulic fluid before and after the purification process to verify that excess water has been reduced to an acceptable level.

- Limit the number of hydraulic purifiers to one per activity because of the infrequent requirement for reconditioning A/M27T-5 SE hydraulic fluid.

- Use an off-line reservoir system in conjunction with a hydraulic purifier to decontaminate hydraulic fluid removed from small-capacity SE reservoirs. Placard the system to warn against mixing incompatible fluids (*e.g.,* hydraulic and motor oils).

PREPRODUCTION INITIATIVE-NELP
INFRARED CAMERA LEAK DETECTOR
GENERAL DESCRIPTION

P2 Opportunity: Locate harbor oil spills efficiently and consistently. Save laboratory chemical testing costs. Identify sources and types of spills, especially during night operations.

Equipment Description: This leak detection system locates and defines petroleum product leaks in a harbor environment. Information is recorded on a PCMCIA card. The date and time of the image captured are accurately recorded. The unit is portable and operates similar to a camcorder. The camera records temperature and emissivity data used to identify and define oil spills.

Implementation Requirements:

- No electrical hook-up. Unit is portable and has a battery pack charging mechanism.
- The unit may also be mounted, but proper environmental protection is required.

Benefits:

- Reduce chemical testing required to locate spills.
- Reduce the amount of petroleum products in harbors by quickly identifying the source of discharge and determining accountability.

Other Information: The Radiance PM is an integrated system with a long lifetime closed-cycle cooler. Unit may be operated at night because it has infrared capabilities. Unit is able to handle vibrations such as those on board ships or small boats.

Procuring Activity Manager:	Jill MacIntyre, 1.1.X.7.1.J.B Naval Air Warfare Center, Aircraft Division Lakehurst, NJ	Tel: (908) 323-1936
Technical Activity POC:	Michael Jones, 4.8.1.3	Tel: (908) 323-2497
Vendor(s):	Amber, A Rathyeon Company	Model: Amber Radiance PM
FY/Site(s):	1995 NELP Initiative, NAS New Orleans	
Cost:	$68,680 (1 unit)	

PREPRODUCTION INITIATIVE-NELP
INFRARED CAMERA LEAK DETECTOR
COST ANALYSIS

PROTOTYPE SITE: NAS JRB New Orleans

DESCRIPTION: Locates and defines petroleum product leaks and spills in the harbor. Records data on the PCMCIA memory card. The system is comprised of a lightweight scanner and control unit. The date and time of the image captured are recorded accurately. The original image is unalterable. The unit is portable and operates similar to a camcorder. The camera records temperature and emissivity data, which is used to identify and define oil spills.

DATA COLLECTION PERIOD: Unit became operational March 13, 1996 at NS Mayport. Obtained preliminary images during training session. The unit was then transferred to NAS JRB New Orleans on 27 February 1997. Awaiting further data.

COST SAVINGS: The site currently performs visual inspections to identify an oil spill in harbor waters. It is difficult to determine the source of the petroleum leak at night. The infrared camera will function as a deterrent to careless handling of petroleum products.

PREVIOUS METHOD: Visual Inspection

Consumables

The site currently uses chemical absorption pads to soak up oil that has been visually identified on the water. The pad changes color to positively identify the presence of oil. The cost and quantity of pads used by the site annually will be quantified.

Labor

E-3 labor rate per hour: $10.39
Cost: TBD

Waste Disposal

Cost: TBD

Total Annual Costs

Item	**Cost**
Consumables	TBD
Labor	TBD
Waste Disposal	TBD
Total	TBD

NELP METHOD: Infrared Camera

Consumables

None

Labor

Cost: TBD

Total Annual Costs

Item	Cost
Consumables	N/A
Labor	TBD
Total	TBD

COST ANALYSIS SUMMARY (PER YEAR)

Visual Inspection	TBD
Infrared Camera	TBD
Cost Change	TBD
Initial Procurement	$68,680.00
Expected Service Life	10 years
Return on Investment (per 10-year period)	TBD
Break Even	TBD

PREPRODUCTION INITIATIVE-NELP
INFRARED CAMERA LEAK DETECTOR
TEST PLAN

1.0 OBJECTIVE

This test plan describes the data collection procedure for the infrared camera leak detector, which, under this application, is being used to detect harbor oil spills. The data will be used to determine the efficiency, effectiveness, and overall performance of the unit. In addition, the data will be analyzed to determine if a characteristic can be shown that will help identify detected spilled materials.

2.0 DESCRIPTION

The Amber-Raytheon Radiance PM is a 10-pound, hand-held, portable infrared camera designed to provide a more efficient alternative to visual inspection of harbor waters for oil spills that occur at night. The unit is a high-resolution, 3 to 5 micron, infrared, focal-plane-array camera with an attached 4" active matrix color LCD display. The unit includes a 4 MB Type 1 PCMCIA card to store 8- or 12-bit images.

3.0 TEST PLAN

This test plan will be used to evaluate the effectiveness of the infrared camera leak detector.

3.1 Test Description

The Radiance PM will be operated according to manufacturer’s instructions. Data will be recorded using this unit every time a night inspection reveals a spill. The AmberTherm Analysis and Report Generation Software will be used to analyze the images that are downloaded from the unit to floppy disks and the site computer hard drive. Data saved on the 3.5" floppy disks will be mailed to UTRS, Inc. (see Section 4.0).

3.2 Data Collection

The operator will use the unit to scan harbor waters. While scanning the harbor, any identified infrared images will be recorded on the PCMCIA Type 1 “flashcard.” The captured image should define the entire boundary of the spill. Either 27 12-bit images or 54 8-bit images can be stored on one card. For the purpose of this test plan, 12-bit images will be captured. The collected images will be loaded onto the designated computer. The following steps should be taken to transfer the images to floppy disk and the computer hard drive:

1. Remove the flashcard from the camera and insert it into the computer PC card socket.

2. Double click on the AmberTherm icon in the Windows Program Manager.

3. Double click on the AmberTherm icon in the AmberTherm window.

4. Click the lightning bolt button, which is located at the upper right-hand corner of the screen, to invoke a “save images” dialog box. A window labeled “flash,” (for Radiance PM flashcard image transfer) will appear.

Only one file name is needed per day to save all images in the FTS format specified for Amber IR images. Each image will be saved with a filename that indicates the Julian date. For example, if the operator enters 96045.FTS as the base file, the software will name each consecutive image as follows: 9604501.FTS, 9604502.FTS, 9604503.FTS, etc. These files represent four different images recorded on February 14, 1996. After entering the file name, click the OK button. All images will be transferred from the flashcard to the disk. The files must also be saved to the computer hard drive.

Data will also be collected (recorded by hand) during each investigation using the attached tables.

3.2.1 Instructions For Completing Table 1

- **Date:** The date the IR Camera was used. This will be recorded on a daily basis.

- **Time Period:** The period of time during which 1 day’s images were recorded (*e.g.,* 8:00 p.m. to 10:00 p.m.).

- **Frequency of Use:** The number of images recorded on a given day during the specified time period. Indicate “0” if no images were recorded. (Please complete Table 2 with an entry for each image collected during a particular time period.)

- **Downtime**

  – **Time Period:** Record periods when unit was not in use. Please indicate the number of day(s) the unit was not in operation.

  – **Reason:** Explain whether downtime was due to repairs, maintenance, service (such as recalibration), or adverse weather conditions.

- **Qualitative Assessment:** Provide a narrative evaluation of the unit. Briefly discuss:

  – Efficiency of the unit (*e.g.,* time and cost savings)

  – Ease of use and the unit’s ability to successfully interface with other site operations

  – Overall satisfaction with the unit.

3.2.2 Instructions for Completing Table 2

- **Date:** The date the image was recorded.

- **Image Number:** Image number (sequential, in the order the images were recorded).

- **Location:** Specify the location of the identified oil spill.

- **Visual Inspection**

  - **Visual Inspection Positive:** Perform a quick visual inspection of the area identified as a spill by the IR camera. Indicate “yes” or “no” as to whether the spill was readily identifiable without the IR camera. Also indicate “yes” or “no” as to whether a light source was utilized.

  - **False Positive:** If, upon visual inspection, the “oil spill” located by the IR camera is not oil, make a general identification of type of substance or object (such as “hot waste waster”) or state whether it is “unidentifiable.”

4.0 REPORTING

The tabular data sheets (Tables 1 and 2) and digital images recorded and downloaded to floppy disk are a concise method of data collection. This data shall be collected for approximately two (2) months and shall be submitted to the following individuals:

Naval Air Warfare Center
Aircraft Division Lakehurst
Route 547 South
M/S 481300B562-3
Lakehurst, NJ 08733
Attn: Michael Jones

Universal Technical Resource Services, Inc.
950 North Kings Highway
Suite 208
Cherry Hill, NJ 08034
Attn: Rick Christ

NAWC Lakehurst and UTRS, Inc. will generate a final report that will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations. Recommendations for fleetwide purchase will be based on timely receipt of the data and the results of these findings.

Table 1

Date	Time Period	Frequency of Use	Downtime	
			Time Period	Reason

Qualitative Assessment*:
Please comment on the effectiveness and efficiency of the unit.

___

___

___

___

* Attach additional sheet if needed.

Table 2

Date	Image Number	Location	Visual Inspection		
			Visual Inspection Positive		False Positive
			Readily Identified	Light Source Utilized	

PREPRODUCTION INITIATIVE-NELP
ISOPROPYL ALCOHOL/CYCLOHEXANE VAPOR DEGREASER
GENERAL DESCRIPTION

P2 Opportunity: Minimize waste, reduce labor hours, and provide a safer operating environment for the removal of grease, dirt, and contaminants from bearings and gyroscopic equipment.

Equipment Description: The IPA/cyclohexane vapor degreaser is a bearing cleaning, degreasing, and drying system capable of processing 15 to 20 baskets of instrument bearings a day. The system consists of one immersion sump with ultrasonic cleaning system, one boiling sump, a vapor zone, and an automated lift handling system inside the console. The azeotrope solvent is a mixture of 67% cyclohexane and 33% isopropyl alcohol and is used to remove grease, oil, solvents, and particulates from bearings.

Implementation Requirements:

- Dimensions: 6" long x 14" wide x 12" deep (sump); 46" long x 36" wide x 48" high (overall)
- Electrical: 460 VAC, 60 Hz, 3 phase, 50 A and 115 VAC, 60 Hz, 1 phase, 5A to power the fire control panel when main power is secured
- Compressed Air: 80 to 95 psi

Benefits:

- Reduce labor hours for cleaning parts.
- Replace the use of ozone-depleting chemicals.
- Provide costs savings in labor, materials, handling, and disposal of hazardous waste.
- Reduce the quantity and toxicity of wastestream.
- Provide a healthier work environment

Other Information: None

Procuring Activity Manager: Jill MacIntyre, 1.1.X.7.1.J.B Tel: (908) 323-1936
Naval Air Warfare Center, Aircraft Division
Lakehurst, NJ

Technical Activity POC: Chris Mahendra, 4.8.2.5 Tel: (908) 323-7131

Vendor(s): Forward Technology, Inc. Model: A Prime/2S

Site(s)/FY: 1994 NELP Initiative, NAS North Island

Cost: $116,175 (1 unit)

PREPRODUCTION INITIATIVE-NELP
ISOPROPYL ALCOHOL/CYCLOHEXANE VAPOR DEGREASER
COST ANALYSIS

PROTOTYPE SITE: NAS North Island

DESCRIPTION: A self-contained system designed to degrease, clean, and dry precision gyroscope bearings using isopropyl alcohol and cyclohexane solvent in lieu of ozone-depleting substances.

DATA COLLECTION PERIOD: January 1996 - September 1996

COST SAVINGS: The cost savings of this unit are largely attributable to the decrease in labor hours required to properly clean precision bearings.

PREVIOUS METHOD: Using Ozone-Depleting Substances to Clean Bearings

Consumables

Gallons of freon per year: 208
Cost per 5 gallons: $222.00
Cost per year: $9,235.20

Gallons of 1,1,1 trichloroethane per year: 660
Cost per 55 gallons: $623.00
Cost per year: $7,476.00

Total cost per year: $16,711.20

Labor

Bearings cleaned per year: 26,000
Direct labor hours per year: 10,920
Rate per hour: $21.92
Cost per year: $239,366.40

Maintenance labor hours per year: 20
Rate per hour: $21.92
Cost per year: $438.40

Total cost per year: $239,804.80

Waste Disposal

Gallons of waste solvent per year: 868
Cost per gallon: $21.82
Cost per year: $18,939.76

Total Annual Costs

Item	Cost
Consumables	$16,711.20
Labor	239,804.80
Waste Disposal	18,939.76
Total	$275,455.76

NELP METHOD: Isopropyl Alcohol/Cyclohexane Vapor Degreaser

Consumables

Gallons of cleaning solution per month: 5
Gallons of cleaning solution per year: 60
Cost per gallon: $5.00
Cost per year: $300.00

Labor

Bearings cleaned per year: 26,000
Direct labor hours per year: 4,420
Rate per hour: $21.92
Cost per year: $96,886.40

Maintenance labor hours per year: 10
Rate per hour: $21.92
Cost per year: $219.20

Total cost per year: $97,105.60

Waste Disposal

Gallons of waste solvent per year: 10 (assume 2 complete changeouts)
Disposal cost per gallon: $1.05
Cost per year: $10.50

Total Annual Costs

Item	Cost
Consumables	$300.00
Labor	97,105.60
Waste Disposal	10.50
Total	$97,416.10

COST ANALYSIS SUMMARY (PER YEAR)

ODS Cleaning	$275,455.76
IPA/Cyclohexane Vapor Degreaser	$97,416.10
Cost Change per Year	$178,039.66
Initial Procurement	$116,175.00
Expected Service Life	10 years
Return on Investment (per 10-year period)	$1,664,221.60 [10 x $275,455.76] - [$116,175.00 + (10 x $97,416.10)]
Break Even	0.65 years [$116,175.00/$178,039.66]

PREPRODUCTION INITIATIVE-NELP
ISOPROPYL ALCOHOL/CYCLOHEXANE VAPOR DEGREASER
TEST PLAN

1.0 OBJECTIVE

This test plan describes the process data collection procedure for the isopropyl alcohol (IPA)/ cyclohexane vapor degreaser. The data will be used to determine the system's efficiency, effectiveness, overall performance, and ability to interface successfully with site operations.

2.0 DESCRIPTION

The IPA/cyclohexane vapor degreaser is a dual-tank cleaner/vapor dryer unit for cleaning precision gyroscope bearings. The unit uses environmentally safe cleaning solvents in place of fluorinated hydrocarbons, which are ozone-depleting substances.

3.0 TEST PLAN

This test plan will be used to evaluate the effectiveness of the IPA/cyclohexane vapor degreaser compared to current methods. During the test period, follow these procedures.

1. Operate the IPA/cyclohexane vapor degreaser according to the manufacturer's instructions.

2. Examine the bearings both before and after cleaning with the IPA/cyclohexane vapor degreaser to determine cleaning effectiveness and whether the bearings incurred damage.

3. Inspect the interior of the system for corrosion at least once a week.

3.1 Approach

Quantitative and qualitative data will be acquired by completion of Tables 1 and 2.

3.1.1 Instructions for Completing Table 1

- **Date:** Indicate the dates the IPA/cyclohexane vapor degreaser was used (month and day).

- **Contaminants Removed:** List the contaminants removed.

- **Item Use**

  – **Number of Batches:** Indicate the frequency of usage on a given date (*e.g.*, 1, 2, 3 times).

- **Quantity:** Indicate the quantity of bearings cleaned/washed on a given date.

- **Consumables Used:** Indicate the type, number of gallons, and cost of consumables used.

- **Consumables Ordered:** Indicate the type, number of gallons, and cost of consumables ordered.

- **Time per Batch:** Indicate the time per unit task (*e.g.*, the cycle time per batch of bearings).

- **Downtime**
  - **Time Period:** Record periods when the unit was not in use.
  - **Reason:** Explain whether downtime was due to repairs, maintenance, workload, or other reasons.

- **Repair Parts Required:** List repair parts required, date, and cost.

- **Qualitative Assessment:** Provide a narrative evaluation of the cleaning abilities of the IPA/cyclohexane vapor degreaser. Briefly discuss:
  - Efficiency of this method (*e.g.*, time and cost savings)
  - Ease of use and the unit's ability to successfully interface with other site operations
  - Overall satisfaction with the cleanliness of the bearings. Inspect the parts for cleanliness and evidence of damage through a wipe test and visual, physical, and mechanical torque examination. Compare results with the cleanliness of bearings washed using other methods.

3.1.2 Instructions for Completing Table 2

- **Date:** Indicate dates the IPA/cyclohexane vapor degreaser was used (month and day). Record on a daily basis.

- **Presence of the Following:** Indicate "yes" or "no" in the appropriate columns. If "yes," list the specific parts that had evidence of the following deficiencies in the Qualitative Assessment section:
  - Corrosion
  - Rust
  - Spots
  - Films
  - Particulates

- **Damage Due To:** Indicate if the IPA/cyclohexane vapor degreaser caused damage or worsened any existing damage. Indicate if the damage is due to the cleaning, degreasing, or drying process.

- **Roughness and Internal Cleanliness:** Indicate results of hand rotation and torque testing (pass or fail).

- **Interior Corrosion of Unit:** Indicate "yes" or "no" based on visual observation; note the exact location and size (area) of the corrosion.

- **Qualitative Assessment:** Provide specific details for any of the above sections marked "yes."

4.0 REPORTING

The data entry forms are a concise method of data collection. Forms should be completed on a daily basis. Data will be collected for 1 year. During this time, periodic status reports on the testing will be submitted to NAWCADLKE. The final report will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations.

Table 1

Date	Contaminants Removed	Item Use		Consumables Used			Consumables Ordered			Time per Batch	Downtime	
		Number of Batches	Quantity	Type	Gallons	Cost	Type	Gallons	Cost		Time Period	Reason

Repair Parts Required

Part	Date	Cost

Qualitative Assessment*:

Provide comments on the effectiveness and efficiency of the unit.

____

____

____

____

*Attach extra sheet if required.

Table 2

	Presence of the Following					Damage Due To			Roughness and Internal Cleanliness		
Date	Corrosion	Rust	Spots	Films	Particulates	Cleaning	Degreasing	Drying	Hand Rotation	Torque Testing	Interior Corrosion of Unit

Qualitative Assessment*:
Provide details on areas marked “yes.”

____

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____

____

*Attach extra sheet if required.

PREPRODUCTION INITIATIVE-NELP
ISOPROPYL ALCOHOL/CYCLOHEXANE VAPOR DEGREASER
FINAL REPORT

NAS NORTH ISLAND, CA

1.0 INTRODUCTION

The U.S. Navy has adopted a proactive and progressive position toward protecting the environment and complying with environmental laws and regulations. Rather than merely controlling and treating hazardous waste by end-of-the-pipe measures, the Navy has instituted a program for Pollution Prevention (P2) to reduce or eliminate the volume and toxicity of waste, air emissions, and effluent discharges.

P2 allows the Navy to meet or exceed current and future regulatory mandates and to achieve Navy-established goals for reducing hazardous waste generation and toxic chemical usage. P2 measures are implemented in a manner that maintains Navy readiness. An additional benefit has been a general increase in operational efficiency.

The Navy has truly set the standard for the procurement and implementation of P2 equipment. The Chief of Naval Operations (CNO), Environmental Protection, Safety, and Occupational Health Division (N45), established the P2 Equipment Program, through which both the Naval Air Warfare Center Lakehurst (NAWCADLKE) and the Naval Facilities Engineering Service Center (NFESC) serve as procurement agents under the direction of (N45). P2 equipment is specified and procured under two complementary initiatives, the Preproduction Initiative (*i.e.,* technology demonstration) and the Competitive Procurement Initiative. The Preproduction Initiative directly supports both the Navy Environmental Leadership Program (NELP) for P2 shore applications and the P2 Afloat program, which prototypes and procures P2 equipment specific to the needs of ships.

This report provides an analysis of the procurement, installation, and operation of P2 equipment under the Preproduction Initiative. Technology demonstrations and evaluation were primarily performed under NELP at two designated NELP sites, NAS North Island and NS Mayport. Additional sites have been added as required to meet mission goals. The program involves defining requirements, performing site surveys, procuring and installing equipment, training operators, and collecting data during an operational test period. The equipment is assessed for environmental benefits, labor and costs savings, and ability to interface with site operations.

2.0 BACKGROUND

Previously, NADEP North Island degreased, cleaned, and dried precision instrument bearings using ozone-depleting chemicals such as freon and 1,1,1, tricholorethane At an average rate of 100 bearings of varying sizes a day, the total annual quantity of freon used and disposed of was 208 gallons and the quantity of 1,1,1 trichloroethane was 660 gallons.

The P2 goal is to eliminate the use of ozone-depleting chemicals and unnecessary labor hours required to clean, degrease, and dry bearings. Also, an automated process will eliminate operator contact with chemicals, thereby creating a safer and healthier working environment.

After conducting a vendor evaluation, Forward Technologies Model A-Prime/2S Isopropyl Alcohol (IPA)/Cyclohexane Vapor Degreaser was selected as the best candidate. The A-Prime/2S is a precision cleaning system that provides state-of-the-art instrument-bearing cleaning. The compact, self-contained unit is explosion-proof and has programmable logic controls (PLCs), a CO_2 automatic fire suppression system, robotic lift loading, water chiller, exhaust blower, and automatic malfunction shut-off system.

3.0 EQUIPMENT DESCRIPTION

3.1 Specifications

- Size: 46" long x 36" wide x 48" high
- Cycle time: 10 minutes
- Capacity: 100 bearings per cycle

3.2 Implementation Requirements

- Electrical: 480 VAC, 60 Hz, 3 phase, 50 A (main power); 115 VAC, 60 Hz, 1 phase, 5 A (fire control panel power)
- Compressed air: 80 to 95 psi

3.3 Benefits

- Replace the use of ozone-depleting chemicals.
- Provide a safer and healthier work environment.
- Reduce unnecessary direct and maintenance labor hours.
- Provide cost savings in labor, materials, handling, and disposal of hazardous waste.
- Reduce the quantity and toxicity of wastestream.

4.0 DATA ANALYSIS

Data was collected from January 1996 through September 1996 based on the Operational Test Plan.

4.1 Quantitative Analysis

Compared with the old method of degreasing, cleaning, and drying precision instrument bearings using ozone-depleting chemicals, the IPA/cyclohexane vapor degreaser has a return on investment (per 10-year period) of $1,664,221.60 per unit. The break-even point is 0.65 years. See the cost analysis for a complete data/cost analysis.

4.2 Qualitative Analysis

4.2.1 Installation

The unit was delivered to the site in October 1995 and became operational in January 1996 upon completion of the appropriate utility work.

4.2.2 Training

The manufacturer supplied a 3-day turnkey training session at the time of installation. The training included troubleshooting of the electrical and mechanical systems.

4.2.3 Maintainability

The system was down for 1 month of the data collection period because of a water pump problem. The manufacturer came to the site and determined that the water pump was missing pieces and reinstalled the appropriate parts. There was also a minor problem with the control system, which the manufacturer also resolved. The manufacturer said that this was a common problem in many of the units produced and would be resolved in all subsequent systems manufactured.

The unit requires 5 gallons of cleaning solvent per month. Depending on the size of the bearings and workload, the IPA/cyclohexane vapor degreaser can handle more than 100 bearings in one batch.

4.2.4 Interface with Site Operations

A minor corrosion problem was found on 41 bearings cleaned during 1 month of data collection. The bearings were already corroded before using the IPA/cyclohexane vapor degreaser. Although this unit degreases, cleans, and dries, it will not remove corrosion. The previous method did not remove corrosion either.

4.2.5 Overall Performance

Overall, the IPA/cyclohexane vapor degreaser provided outstanding performance. The cost savings in labor alone make this unit worthwhile. The environmental benefits are also significant, as it eliminates the use of ozone-depleting chemicals for degreasing, cleaning, and drying bearings.

5.0 LESSONS LEARNED

- Investigate other possible applications for the IPA/cyclohexane vapor degreaser, such as cleaning and degreasing gyroscopic components for use on other aircraft systems.

6.0 CONCLUSIONS

The IPA/cyclohexane vapor degreaser provides many benefits to the end user and environment.

- Eliminates use of ozone-depleting chemicals to clean bearings.
- Provides safer and healthier work environment.
- Reduces maintenance hours by 50%.
- Reduces direct labor hours by 60%.
- Reduces unnecessary labor cleaning hours, providing tremendous cost savings.

The results of this study indicate that the IPA/cyclohexane vapor degreaser is an excellent system for any Navy facility that currently degreases, cleans, and dries bearings.

PREPRODUCTION INITIATIVE-NELP
LOW-EMISSIONS DIESEL (A/M27T-5)
GENERAL DESCRIPTION

P2 Opportunity: Demonstrate the feasibility of installing a low-emissions diesel engine capable of being certified to Federal and San Diego County 1996 emission standards into an existing A/M27T-5 portable hydraulic power supply.

Equipment Description: Two A/M27T-5 portable hydraulic power supplies were modified to accept a low-emissions diesel engine, Petter Model 804ISI25.55. Emissions from this engine will be measured to certify that they meet the 1996 federal and San Diego County, CA standards and the County of San Diego Air Pollution Control District rules for off-road use.

Implementation Requirements:

- Modification of A/M27T-5 units.

Benefits:

- Reduce diesel engine exhaust emissions while meeting all Navy performance specifications established for the A/M27T-5 portable hydraulic power supply with the original engine.

Other Information: Expected operational date is November 1996. Cost includes reengineering and testing.

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Naval Air Warfare Center, Aircraft Division
Lakehurst, NJ

Technical Activity POC: Jim Ambrosino, 4.8.2.5 — Tel: (908) 323-7904

Vendor(s): Hydraulics International, Inc. — Model: A/M27T-5

FY/Site(s): 1994 NELP Initiative, NAS North Island

Cost: $236,445 (2 units)

PREPRODUCTION INITIATIVE-NELP
LOW-EMISSIONS DIESEL (A/M27T-5)
COST ANALYSIS

PROTOTYPE SITE: NAS North Island

DESCRIPTION: The A/M27T-5 portable hydraulic power supply is currently undergoing modifications to replace the existing diesel engine with a low emissions diesel engine that meets the 1996 Environmental Protection Agency (EPA) emission standards of San Diego County, CA and the County of San Diego Air Pollution Control District (SDAPCD) rules and regulations for nonroad diesel engines. A contract for two systems has been awarded to Hydraulic International, Inc.

DATA COLLECTION PERIOD: The units were delivered in January 1997. Data collection will begin when the units become operational.

COST SAVINGS: The new diesel engine will allow for continued operation of the A/M32C-17 units despite stringent air pollution control requirements.

PREVIOUS METHOD: A/M27T-5 with Model 3-53 Detroit Diesel

Consumables

N/A

Labor

N/A

Waste Disposal

N/A

Exhaust Emissions

TBD

Total Annual Costs

N/A

NELP METHOD: Modified System A/M27T-5 with Petter Engine Model 8041Si25.55

Consumables

N/A

Labor N/A

Waste Disposal

N/A

Exhaust Emissions

TBD

Total Annual Costs

N/A

Initial Procurement Costs (Two Systems)

Recurring	$52,368.00
Non-Recurring	184,076.50
GFE Repair	TBD
Total	$236,444.50

COST ANALYSIS SUMMARY (PER YEAR)

A/M27T-5 with Model 3-53 Detroit Diesel	TBD
A/M27T-5 with Petter Engine Model 8041Si 25.55	TBD
Cost Change	TBD
Initial Procurement	$236,444.50
Expected Service Life	10 years
Return on Investment (per 10-year period)	TBD
Break Even	TBD

PREPRODUCTION INITIATIVE-NELP
LOW-EMISSIONS DIESEL (A/M32C-17)
GENERAL DESCRIPTION

P2 Opportunity: Reduce diesel emissions from support equipment. Demonstrate the feasibility of installing a low-emissions diesel engine capable of being certified to Federal and San Diego County 1996 emission standards into an existing A/M32C-17 mobile air conditioner.

Equipment Description: Two A/M32C-17 mobile air conditioner systems were modified to accept a low-emissions diesel engine, John Deere Model 6081A. Emissions from this engine will be measured to certify that they meet the 1996 federal and San Diego County, CA standards and the County of San Diego Air Pollution Control District rules for off-road use.

Implementation Requirements:

- Modification of the A/M32C-17 units.

Benefits:

- Reduce diesel engine exhaust emissions while meeting all Navy performance specifications established for the A/M32C-17 mobile air conditioner with the original engine.

Other Information: Expected operational date is May 1997. Cost includes reengineering and testing.

Procuring Activity Manager:	Jill MacIntyre, 1.1.X.7.1.J.B Naval Air Warfare Center, Aircraft Division Lakehurst, NJ	Tel: (908) 323-1936
Technical Activity POC:	Jim Ambrosino, 4.8.2.5	Tel: (908) 323-7904
Vendor(s):	KECO Industries	Model: A/M32C-17
FY/Site(s):	1994 NELP Initiative, NAS North Island	
Cost:	$370,614 (2 units)	

PREPRODUCTION INITIATIVE-NELP
LOW-EMISSIONS DIESEL (A/M32C-17)
COST ANALYSIS

PROTOTYPE SITE: NAS North Island

DESCRIPTION: The A/M32C-17 portable air conditioner is currently undergoing modifications to replace the existing diesel engine with a low emissions diesel engine that meets the 1996 EPA emission standards of San Diego County, CA and the County of San Diego Air Pollution Control District (SDAPCD) rules and regulations for nonroad diesel engines. A contract for two systems has been awarded to KECO Industries, Inc.

DATA COLLECTION PERIOD: Units are scheduled to be shipped in April 1997. Data collection will begin shortly thereafter.

COST SAVINGS: The new diesel engine will allow for continued operation of the A/M32C-17 units despite stringent air pollution control requirements.

PREVIOUS METHOD: A/M32C-17 with Model 6V-71 Detroit Diesel

Consumables

N/A

Labor

N/A

Waste Disposal

N/A

Exhaust Emissions

TBD

Total Annual Costs

N/A

NELP METHOD: A/M32C-17 with John Deere Engine Model 6081A

Consumables

N/A

Labor

N/A

Waste Disposal

N/A

Exhaust Emissions

TBD

Total Annual Costs

N/A

Initial Procurement Costs (Two Systems)

Item	**Cost**
Recurring	$91,804.64
Non-Recurring	272,903.73
GFE Repair	5,905.32
Total	$370,613.69

COST ANALYSIS SUMMARY (PER YEAR)

A/M32C-17 with Model 6V-71 Detroit Diesel	TBD
A/M32C-17 with John Deere Engine Model 6081A	TBD
Cost Change	TBD
Initial Procurement	$370,613.69
Expected Service Life	10 years
Return on Investment (per 10-year period)	TBD
Break Even	TBD

PREPRODUCTION INITIATIVE-NELP
LOW-EMISSIONS DIESEL (NC-10C)
GENERAL DESCRIPTION

P2 Opportunity: Reduce diesel emissions from NC-10C mobile electric power plants (MEPPs) used for aircraft servicing.

Equipment Description: Low-emission diesel engines have been installed in two NC-10C MEPP production units. The engines are suitable for certification under federal and San Diego County 1996 emission standards for off road diesel engines.

Implementation Requirements:

- Manufacturer must modify present NC-10C production models to accept low-emission diesel engine.

Benefits:

- Provide data to support future acquisition of compliant low-emissions diesel support equipment.

Other Information: Two NC-10C MEPPs are currently being studied to determine the feasibility of making modifications.

Procuring Activity Manager:	Jill MacIntyre, 1.1.X.7.1.J.B Naval Air Warfare Center, Aircraft Division Lakehurst, NJ	Tel: (908) 323-1936
Technical Activity POC:	Jerry Bennett, 4.8.10.7	Tel: (908) 323-7418
Vendor(s):	Essex Electro Engineers, Inc.	Model: NC-10C
FY/Site(s):	1994 NELP Initiative, NAS North Island	
Cost:	$152,210 (2 units)	

PREPRODUCTION INITIATIVE-NELP
NITRITE TREATMENT SYSTEM
GENERAL DESCRIPTION

P2 Opportunity:	Activities generate large volumes of wastewater containing sodium nitrite from the testing, hydroblasting, and cleaning of shipboard boilers. Current Navy industrial wastewater treatment plants cannot pretreat this wastestream before release into local waterways. However, this system treats wastewater so that it can be safely discharged or reused.	
Equipment Description:	The nitrite treatment system is being developed as a preproduction project. A central fixed system is being developed for use at industrial wastewater treatment plants. A mobile system is being developed for pierside use.	
Implementation Requirements:	• Electrical connections • Wastewater plumbing	
Benefits:	• Ensure safe discharge of treated wastewater. • Enable reuse of treated wastewater.	
Other Information:	None	
Procuring Activity Manager:	Eugene Wang, Code 423 Naval Facilities Engineering Service Center Port Hueneme, CA	Tel: (805) 982-4832
Technical Activity POC:	Dr. Richard Lee, Code 421 Naval Facilities Engineering Service Center Port Hueneme, CA	Tel: (805) 982-1670
Vendor(s):	A.D. Little	Model: TBD
FY/Site(s):	1995 NELP Initiative, NAS North Island	
Cost:	$275,000 (1 system)	

PREPRODUCTION INITIATIVE-NELP
OIL RECYCLER
GENERAL DESCRIPTION

P2 Opportunity: Reduce oil contaminants during engine operation to extend oil change intervals and reduce cost of engine operations.

Equipment Description: Self-contained, canister-shaped oil purifier units are attached to equipment engine compartments. Batch system is mounted on wheels to facilitate movement for maintenance.

Implementation Requirements:

- Electrical: VAC for batch refiner; VDC for canister models
- Hoses and fittings

Benefits:

- Reduce amount of waste oil for disposal.
- Reduce maintenance time for oil changes.
- Reduce procurement cost of oil.

Other Information: None

Procuring Activity Manager: Jill MacIntyre, 1.1.X.7.1.J.B Tel: (908) 323-1936
Naval Air Warfare Center, Aircraft Division
Lakehurst, NJ

Technical Activity POC: Jill MacIntyre, 1.1.X.7.1.J.B Tel: (908) 323-1936
Naval Air Warfare Center, Aircraft Division
Lakehurst, NJ

Vendor(s): TF Purifiner Model: Various

FY/Site(s): 1994 NELP Initiative, NS Mayport

Cost: $16,731 (5 oil purifier units)

PREPRODUCTION INITIATIVE-NELP
OIL RECYCLER (NC-8A-1 MEPP AND A/S 32A-30A TOW TRACTOR)
TEST PLAN

1.0 OBJECTIVE

This test plan describes the data collection procedures that will be used to gather performance data on the TF Purifiner ultra-high bypass filter for diesel engine oil.

2.0 BACKGROUND

Currently, NS Mayport generates more than 50,000 pounds of waste engine oil per year. The costs associated with oil usage (such as material, labor, storage, and waste disposal) make usage reduction a primary consideration. At this time, oil changes in support equipment (SE) are determined by one of two ways—either the oil is contaminated or the time interval maintenance cycle has been reached. Although this maintenance concept ensures that the equipment is well-maintained, it does not help reduce oil consumption and waste. Studies on oil degradation, contamination, and engine wear have shown that if the oil is filtered to remove contaminants greater than 1 micron, the oil does not have to be changed. In fact, some data have shown that in-service, highly-filtered oil improves with age. To better assess this technology and its viability for government equipment, an ultra-high batch filtration system was selected for evaluation. The filtration system selected is manufactured by TF Purifiner, Inc. The filtration system will be evaluated for 1 year on two different types of SE. One is a NC-8A MEPP unit and the other is an AS-32A-30A tow tractor. The equipment will be maintained by AIMD maintenance ship, Building 1553.

3.0 TEST PLAN

This test plan describes the test, procedures for performing the test, and directions for collecting and recording the test data.

3.1 Test Description

This section describes the test plan for the NC-8A and 32A-30A SE units. These procedures shall incorporate the manufacturer's recommended maintenance schedule for filter change and oil sampling.

3.1.1 Installation Procedures

At the time of installation, oil samples of the old oil were taken and tested by a laboratory to provide baseline data on the condition of the engine. The oil and full flow filters were changed when the TF purifier systems were installed. Also, oil samples of the new oil were take and tested by a laboratory to provide baseline information on the new oil. In addition, particle testing using a Diagnetics portable contamination monitor was performed and logged in Tables 1 and 2, respectively.

- Take a sample of the old oil for laboratory testing and conduct a particle count on the old oil using a Diagnetics Portable Contamination Monitor.

- Drain the old oil and change the full flow oil filter.

- Install the TF Purifier filtration system.

- Take a sample of the new oil for laboratory testing and conduct a particle count on the new oil using a Diagnetics Portable Contamination Monitor.

- Fill the engine with the new oil.

- The following information was determined during installation for the NC-8A-1 MEPP unit:

  – SE model number: NC-8A-1
  – SE part number: 65A81-J1-03
  – SE serial number: 261-046
  – Engine manufacturer: Detroit Diesel
  – Engine model number: 50437201
  – Engine serial number: 400068565
  – Crankcase capacity: 7 qts.
  – Oil specification: MIL-L-2104E, OE/HDO-30, 30 wt.
  – TF Purifier model no.: TF-24-P
  – TF Purifier serial no.: 0295381
  – Date Installed: 7 March 1995
  – Hours on engine: 643.53
  – Purifier filter no.: TF-24F

- The following information was determined during installation for the A/S 32A-30A tow tractor.

  – SE model number: S 32A-30A
  – SE part number: 60D60V
  – SE serial number: RYR310
  – Engine manufacturer: Continental, Teledyne WF Industries
  – Engine model number: TMD 27
  – Engine serial number: 92090381
  – Crankcase capacity: 16 qts.
  – Oil specification: MIL-L-2104E, OE/HDO-30, 30 wt.
  – TF Purifier model no.: TF-12-P
  – TF Purifier serial no.: 0295379

- Date installed: 9 March 1995
- Hours on engine: 336.0
- Purifier filter no.: TF-12F

3.1.2 Normal Operating Procedures

- Take an oil sample every 30 days and send to the laboratory for testing. Conduct a particle count on the oil using a Diagnetics Portable Contamination Monitor.

- Log the particle count data and other applicable data in Tables 1, 2, and 3, as appropriate.

- Change the full flow filter and TF Purifier filter after 12 weeks. Only add oil. Do not change the oil.

- Continue taking an oil sample every 30 days and send to the laboratory for testing. Conduct a particle count on the oil using a Diagnetics Portable Contamination Monitor.

- Change the full flow filter and TF Purifier filter after 24 weeks. Only add oil. Do not change the oil.

3.2 Oil Sampling

The site was provided with oil analysis test kits to simplify the testing and analysis of the oil being filtered by the TF Purifier filter systems. Oil samples will be taken every 30 days and when the filter is changed.

Follow these procedures when taking an oil sample.

1. Always take an oil sample when the oil is hot.

2. Remove the dustcap from the Purifier oil sample valve at the bottom of the unit.

3. With the engine running, open the sample valve and fill up (1) the oil sample bottle provided in the laboratory kit and (2) a test bottle for the particle count. Label the samples appropriately.

4. Make sure the sample valve is closed tightly and replace the dust cap.

5. Complete the laboratory submission data sheets shown in Table 3. Provide the following information on the sheet:

   - Sample number

- Date taken
- Miles/hours on oil
- Miles/hours on unit
- Oil added (quarts)
- Full flow filter change (yes/no)
- Purifier filter change (yes/no)

6. Place the completed sheet in the shipping container with the oil sample and place in the mail.

4.0 REPORTING

Each month, the test site shall forward copies of the data logged in Tables 1, 2, and 3 to the Naval Air Warfare Center, Aircraft Division, Lakehurst (NAWCADLKE). The data entry form is a concise method of data collection. Data will be collected for 1 year. During this time, periodic status reports on the testing will be submitted to NAWCADLKE. The final report will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations.

Table 1 should be used to tabulate particle count data taken on oil samples used in the NC-8A-1 MEPP unit.

TABLE 1. PARTICLE COUNT TEST DATA, NC-8A-1

	OLD OIL	NEW OIL	(1) 30 DAYS	(2) 60 DAYS	(3) 90 DAYS	(4) 120 DAYS	(5) 150 DAYS	(6) 180 DAYS	(7) 210 DAYS	(8) 240 DAYS	(9) 270 DAYS	(10 300 DAYS	(11) 330 DAYS	(12) 360 DAYS
DATE	3/9/95	3/9/95												
PART. CNT. >10 /ML	1702	292												
GRAVITY	11.8	2.0												
ISO	20/17	17/14												
SAE	8	6												
NAS (>5u)	12	9												
>5	5531	949												
>10	1702	292												
>15	703	120												
>25	188	32												
>30	111	19												
>50	22	3												
>100	1	0												

Table 2 should be used to tabulate particle count data taken on oil samples used in the A/S 32A-30A tow tractor unit.

TABLE 2. PARTICLE COUNT TEST DATA, A/S 32A-30A

	OLD OIL	NEW OIL	(1) 30 DAYS	(2) 60 DAYS	(3) 90 DAYS	(4) 120 DAYS	(5) 150 DAYS	(6) 180 DAYS	(7) 210 DAYS	(8) 240 DAYS	(9) 270 DAYS	(10 300 DAYS	(11) 330 DAYS	(12) 360 DAYS
DATE	3/9/95	3/9/95												
PART. CNT. >10 /ML	1605	292												
GRAVITY	11.1	2.0												
ISO	20/17	17/14												
SAE	8	6												
NAS (>5u)	11	9												
>5	5216	949												
>10	1605	292												
>15	663	120												
>25	177	32												
>30	105	19												
>50	20	3												
>100	1	0												

Table 3
Laboratory Submission Data Sheet

Sample number:		
Date taken:		
Mile/hours on oil:		
Mile/hours on unit:		
Oil added (quarts):		
Full flow filter change:	**Yes**	**No**
Purifier filter change:	**Yes**	**No**

Qualitative Assessment*:
Please comment on the effectiveness and efficiency of the unit.

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*Attach extra sheet if required

PREPRODUCTION INITIATIVE-NELP
OIL RECYCLER (50' MK1 WORK BOAT)
TEST PLAN

1.0 OBJECTIVE

This test plan describes the data collection procedures that will be used to gather performance data on the TF Purifiner ultra-high bypass filter for diesel engine oil.

2.0 BACKGROUND

Currently, NS Mayport generates more than 50,000 pounds of waste engine oil per year. The costs associated with oil usage (such as material, labor, storage, and waste disposal) make usage reduction a primary consideration. At this time, oil changes in support equipment (SE) are determined by one of two ways—either the oil is contaminated or the time interval maintenance cycle has been reached. Although this maintenance concept ensures that the equipment is well-maintained, it does not help reduce oil consumption and waste. Studies on oil degradation, contamination, and engine wear have shown that if the oil is filtered to remove contaminants greater than 1 micron, the oil does not have to be changed. In fact, some data have shown that in-service, highly-filtered oil improves with age. To better assess this technology and its viability for government equipment, an ultra-high batch filtration system was selected for evaluation. The filtration system selected is manufactured by TF Purifiner, Inc. The filtration system will be evaluated for 1 year on a 50' MK1 work boat. The equipment will be maintained by the Harbor Operations maintenance shop.

3.0 TEST PLAN

This test plan describes the test, procedures for performing the test, and directions for collecting and recording the test data.

3.1 Test Description

This section describes the test plan for a 50' MK1 work boat, WB843. These procedures shall incorporate the manufacturer's recommended maintenance schedule for filter change and oil sampling.

3.1.1 Installation Procedures

At the time of installation, oil samples of the old oil were taken on the port and starboard engine and tested by a laboratory to provide baseline data on the condition of the engine. Also, oil samples of the new oil were taken and tested by a laboratory to provide baseline information on new oil. In addition, particle testing using a Diagnetics portable contamination monitor was also performed. The data was recorded in Tables 1 and 2, respectively.

- Take an oil sample of the old oil for laboratory test.

- Install the TF Purifiner filtration system.

- Take an oil sample of the new oil for laboratory testing and conduct a particle count on the new oil using a Diagnetics Portable Contamination Monitor.

- The following information was determined during installation.

  – Boat number: 1
  – Boat serial number: WB843
  – Engine manufacturer: Detroit Diesel
  – Engine model number:
  – Port Engine serial number:
  – Starboard engine serial number:
  – Crankcase capacity: 15 gal.
  – Oil specification: 9250, 50 wt.
  – TF Purifiner model no.: TF-60-P
  – Port engine TF Purifiner serial no.: 0295383
  – Starboard engine TF Purifiner serial no.: 0295386
  – Date Installed: 8 March 1995
  – Hours on port engine: 1253.41
  – Hours on starboard engine: 1318.82
  – Purifiner filter no.: TF-60F

3.1.2 Normal Operating Procedures

- Take an oil sample every 30 days and send to the laboratory for testing.

- Change full flow filter and TF Purifiner filter in 12 weeks. Only add oil. Do not change the oil.

- Every 30 days, take an oil sample and send to the laboratory for testing and conduct a particle count using a Diagnetics Portable Contamination Monitor.

- Change full flow filter and TF Purifiner filter in 24 weeks. Only add oil. Do not change the oil.

3.2 Oil Sampling

The site has been provided with oil analysis test kits to simplify the testing and analysis of the oil being filtered by the TF Purifiner filter systems. Oil samples will be taken every 30 days when the filter is changed.

Follow these procedures when taking oil samples.

1. Always take an oil sample when oil is hot.

2. Remove the dust cap from the Purifiner oil sample valve at the bottom of the unit.

3. With the engine running, open the sample valve and fill up (1) the oil sample bottle provided in the laboratory kit and (2) a test bottle for the particle count. Label the samples appropriately.

4. Make sure the sample valve is closed tightly and replace the dust cap.

5. Complete the laboratory submission data sheet in Table 2. Provide the following information on the sheet:

   – Sample number

   – Date Taken

   – Miles/hours on oil

   – Miles/hours on unit

   – Oil added (quarts)

   – Full flow filter change (yes/no)

   – Purifiner filter change (yes/no)

6. Place the completed sheet in the shipping container with the oil sample and place in the mail.

4.0 REPORTING

Each month, the test site shall forward copies of the data logged in Tables 1 and 2 to the Naval Air Warfare Center, Aircraft Division, Lakehurst (NAWCADLKE). The data entry form is a concise method of data collection. Data will be collected for 1 year. During this time, periodic status reports on the testing will be submitted to NAWCADLKE. The final report will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations.

Table 1
Particle Count Test Data

Table 1 is used to tabulate particle count data taken on oil samples used in the WB843, 50' work boat. The information provided below was obtained during installation.

	OLD OIL PORT ENGINE	**OLD OIL STARBOARD ENGINE**	**NEW OIL**
DATE	3/9/95	3/9/95	3/9/95
PART. CNT. >10 /ML	247	199	217
GRAVITY	1.7	1.4	1.5
ISO	17/14	17/14	17/14
SAE	5	5	5
NAS (>5u)	9	8	9
>5	802	646	705
>10	247	199	217
>15	102	82	89
>25	27	22	24
>30	16	13	14
>50	3	2	2
>100	0	0	0

Table 2
Laboratory Submission Data Sheet

Sample number:		
Date taken:		
Mile/hours on oil:		
Mile/hours on unit:		
Oil added (quarts):		
Full flow filter change:	**Yes**	**No**
Purifier filter change:	**Yes**	**No**

Qualitative Assessment*:
Please comment on the effectiveness and efficiency of the unit.

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*Attach extra sheet if required

PREPRODUCTION INITIATIVE-NELP
OIL RECYCLER (KUBOTA TRACTOR)
TEST PLAN

1.0 OBJECTIVE

This test plan describes the data collection procedures that will be used to gather performance data on the TF Purifiner ultra-high bypass filter for diesel engine oil.

2.0 BACKGROUND

Currently, NS Mayport generates more than 50,000 pounds of waste engine oil per year. The costs associated with oil usage (such as material, labor, storage, and waste disposal) make usage reduction a primary consideration. At this time, oil changes in government equipment are determined by one of two ways—either the oil is contaminated or the time interval maintenance cycle has been reached. Although this maintenance concept ensures that the equipment is well-maintained, it does not help reduce oil consumption and waste. Studies on oil degradation, contamination, and engine wear have shown that if the oil is filtered to remove contaminants greater than 1 micron, the oil does not have to be changed. In fact, some data have shown that in-service, highly-filtered oil improves with age. To better assess this technology and its viability for government equipment, an ultra-high batch filtration system was selected for evaluation. The filtration system selected is manufactured by TF Purifiner, Inc. The filtration system will be evaluated for 1 year on a Kubota tractor used to maintain the lawns at NS Mayport. The equipment will be maintained by the vehicle maintenance shop, Building 349.

3.0 TEST PLAN

This test plan describes the test, procedures for performing the test, and directions for collecting and recording the test data.

3.1 Test Description

This section describes the test plan for a Kubota tractor. These procedures shall incorporate the manufacturer's recommended maintenance schedule for filter change and oil sampling.

3.1.1 Installation Procedures

At the time of installation, oil samples of the old oil were taken and tested by a laboratory to provide baseline data on the condition of the engine. The oil and full flow filters were changed. Also, oil samples of the new oil were taken and tested by a laboratory to provide baseline information on new oil.

- Take an oil sample of the old oil for laboratory testing.
- Drain the old oil, and change the full flow oil filter.

- Install the TF Purifiner filtration system.

- Take an oil sample of the new oil for laboratory testing.

- Fill the engine with the new oil.

- The following information was determined during installation.

  – Tractor manufacturer: Kubota
  – Tractor part number: M4030SU
  – Tractor serial number: 2217
  – Engine manufacturer: Kubota
  – Engine model number: F2402-D1-A
  – Engine serial number:
  – Crankcase capacity: 13.4 qts.
  – Oil specification:
  – TF Purifiner model no.: TF-24P
  – TF Purifiner serial no.:
  – Date Installed:
  – Hours on engine:
  – Purifiner filter no.: TF-24F

3.1.2 Normal Operating Procedures

- Take an oil sample every 30 days and send to the laboratory for testing

- Change the full flow filter and TF Purifiner filter in 12 weeks. Only add oil. Do not change the oil.

- Continue taking an oil sample every 30 days and send to the laboratory for testing

- Change the full flow filter and TF Purifiner filter in 24 weeks. Only add oil. Do not change the oil.

3.2 Oil Sampling

The site has been provided with an oil analysis test kits to simplify the testing and analysis of the oil being filtered by the TF Purifiner filter systems. Oil samples will be taken every 30 days and when the filter is changed.

Follow these procedures when taking oil samples.

1. Always take an oil sample when oil is hot.

2. Remove the dustcap from the TF Purifiner oil sample valve at the bottom of the unit.

3. With the engine running, open the sample valve and flush the sample bottle twice with oil before taking the final sample. After flushing, fill up the oil sample bottle provided. Label the samples.

4. Make sure the sample valve is closed tightly and replace the dust cap.

5. Complete the laboratory submission data sheet provided in Table 1. Provide the following information:

   – Sample Number

   – Date Taken

   – Miles/hours on oil

   – Miles/hours on unit

   – Oil added (quarts)

   – Full flow filter change (yes/no)

   – Purifiner filter change (yes/no)

6. Place the completed sheet in the shipping container with the oil sample and place in the mail.

4.0 REPORTING

Each month, the test site shall forward copies of the data logged in Table 1 to the Naval Air Warfare Center, Aircraft Division, Lakehurst (NAWCADLKE). The data entry form is a concise method of data collection. Data will be collected for 1 year. During this time, periodic status reports on the testing will be submitted to NAWCADLKE. The final report will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations.

Table 1
Laboratory Submission Data Sheet

Sample number:		
Date taken:		
Mile/hours on oil:		
Mile/hours on unit:		
Oil added (quarts):		
Full flow filter change:	**Yes**	**No**
Purifier filter change:	**Yes**	**No**

Qualitative Assessment*:
Please comment on the effectiveness and efficiency of the unit.

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*Attach extra sheet if required

PREPRODUCTION INITIATIVE-NELP
OIL RECYCLER (TUG BOAT)
TEST PLAN

1.0 OBJECTIVE

This test plan describes the data collection procedures that will be used to gather performance data on the TF Purifiner ultra-high bypass filter for diesel engine oil.

2.0 BACKGROUND

Currently, NS Mayport generates more than 50,000 pounds of waste engine oil per year. The costs associated with oil usage (such as material, labor, storage, and waste disposal) make usage reduction a primary consideration. At this time, oil changes in government equipment are determined by one of two ways—either the oil is contaminated or the time interval maintenance cycle has been reached. Although this maintenance concept ensures that the equipment is well-maintained, it does not help reduce oil consumption and waste. Studies on oil degradation, contamination, and engine wear have shown that if the oil is filtered to remove contaminants greater than 1 micron, the oil does not have to be changed. In fact, some data have shown that in-service, highly-filtered oil improves with age. To better assess this technology and its viability for government equipment, an ultra-high batch filtration system was selected for evaluation. The filtration system selected is manufactured by TF Purifiner, Inc. The filtration system will be evaluated for 1 year on a tug boat at NS Mayport. The equipment will be maintained by Harbor Operations.

3.0 TEST PLAN

This test plan describes the test, procedures for performing the test, and directions for collecting and recording the test data.

3.1 Test Description

This section describes the test plan for the tug boat. These procedures shall incorporate the manufacturer's recommended maintenance schedule for filter change and oil sampling. The following is a general outline of the test plan for the tug boat main diesels in conjunction with the TF Purifiner batch filtration system.

3.1.1 Installation Procedures

- Install the hydraulic quick disconnects on the heater preheater for interfacing with the TF Purifiner system.

- At the time of installation, oil samples of the old oil will be taken and tested by a laboratory to provide baseline data on the condition of the engine. Also, oil samples of the new oil will be taken and tested by a laboratory to provide baseline information on the new oil.

- The following information was determined during installation:

  - Tug boat number: Tug #1
  - Tug boat serial number: 769
  - Engine manufacturer: Fairbanks Morse
  - Engine model number: 38D 8 1/8
  - Engine serial number: 9702812
  - Crankcase capacity: 215 main with a preheater 350 gallons
  - Oil specification: 10W50
  - Date installed: 19 April 1995
  - Hours on engine: 621 hours since rebuild

3.1.2 Normal Operating Procedures

- Run the engine for 30 minutes, take an oil sample, and mail the sample for testing.

- Connect the TF Purifiner batch filtration system to the oil warmer system.

- Run the TF Purifiner system for 15 continuous hours on the first day.

- Take an oil sample and mail the sample for testing.

- Run the TF Purifiner system for 15 continuous hours on the second day.

- Take an oil sample and mail the sample for testing.

- Change the oil filters in the TF Purifiner system.

- Use the engine in normal operations.

- Run the engine for 2 weeks.

- Repeat filtration cycle for a period of 6 months.

Note: If daily/weekly oil samples show significant fuel/water dilution:

- Connect the TF Purifiner batch filtration system and run for 15 continuous hours.
- Shut down the engine and take an oil sample.
- Mail the sample for testing.

3.2 Oil Sampling

The site was provided with oil analysis test kits to simplify the testing and analysis of the oil being filtered by the TF Purifiner filter systems. Oil samples will be taken prior to and at the end of every batch filtration process.

Follow these procedures when taking oil samples.

1. Always take an oil sample when the oil is hot and after the engine has run for 30 minutes.

2. Remove the dust cap from the Purifiner oil sample valve at the bottom of the unit.

3. With the engine running, open the sample valve and flush the sample bottle twice with oil before taking the final sample. After flushing, fill up the oil sample bottle. Label the sample appropriately.

4. Make sure the sample valve is closed tightly and replace the dust cap.

5. Complete the laboratory submission data sheet shown in Table 1. The sheet is partially completed. Complete a new sheet each time a sample is taken.

6. Place the completed sheet in the appropriate shipping container with the oil sample and mail to the laboratory for testing.

4.0 REPORTING

Each month, the test site shall forward copies of the data logged in Table 1 to the Naval Air Warfare Center, Aircraft Division, Lakehurst (NAWCADLKE). The data entry form is a concise method of data collection. Data will be collected for 1 year. During this time, periodic status reports on the testing will be submitted to NAWCADLKE. The final report will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations.

Table 1
Laboratory Submission Data Sheet

Sample number:	
Date taken:	
Time on engine:	
Sample taken before or after filtration:	
Tug boat number:	Tug #1
Tug boat serial number:	769
Engine manufacturer:	Fairbanks Morse
Engine model number:	38D 8 1/8
Engine serial number:	9702812
Oil specification:	10W50
Hours on engine at the start of test:	621 hours since rebuild

Qualitative Assessment*:
Please comment on the effectiveness and efficiency of the unit.

____

____

____

*Attach extra sheet if required

PREPRODUCTION INITIATIVE-NELP
PAINT GUN WASHER
GENERAL DESCRIPTION

P2 Opportunity: Minimize paint thinner waste and solvent-soaked rags. Eliminate VOC emissions. Provide an alternative to the labor-intensive task of manually cleaning paint guns.

Equipment Description: The paint gun washer is an automated, closed-loop system that flushes and cleans paint guns. The solvent is reused numerous times before disposal is required, thereby reducing the quantity of spent solvent and rags that must be disposed of as hazardous waste.

Implementation Requirements:

- Electric: No power requirements. The unit must be electrically grounded.
- Compressed Air: 1/4 npt (f) air inlet
- Pressure Operating Range: 25 to 100 psi
- Optional 25' hose available to connect unit air inlet to shop air line
- Air pressure regulator, master air valve, 1/4 npt (m) coupler included for ease of installation.

Benefits:

- Reduce labor to clean paint guns by hand.
- Reduce quantity of solvent used in cleaning process.
- Reduce costs by decreasing waste solvent, paint rags, and process time.
- Meet stringent air quality rules, including South Coast Air Quality Management (SCAQMD) Rule 1171 for VOC emissions.

Other Information: Solvents used in the unit should be selected based on the type of coatings to be removed. Try to select the least hazardous applicable solvent.

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Vendor(s): Graco, Inc. — Model: 112-636

FY/Site(s): 1994 NELP Initiative, NAS North Island, NS Mayport

Cost: $3,188 (2 units)

PREPRODUCTION INITIATIVE-NELP
PAINT GUN WASHER
COST ANALYSIS

PROTOTYPE SITES: NAS North Island, NS Mayport

DESCRIPTION: Flushes and cleans paint guns in less than 1 minute. The solvent is reused numerous times, thereby reducing waste. This closed-loop system complies with air quality regulations, including the South Coast Air Quality Management District (SCAQMD) Rule 1171 concerning volatile organic compounds (VOCs).

DATA COLLECTION PERIOD: March 1995 - February 1996

PREVIOUS METHOD: Manual Cleaning of Paint Guns

Consumables

Quarts of solvent (A-A-857, MIL-T-81772) used per day: 2
Quarts used per year: 520
Cost per year: $1,053.60

Rags used for each gun/cup cleaned: 4
Rags used per month: 67 (average)
Rags used per year: 804
Cost per rag: $0.10
Cost per year: $80.40

Labor

E-3 labor rate per hour: $10.39
Hours per month to manually clean parts: 24.88 (average)
Hours per year: 298.5
Cost per year: $3,101.42

Waste Disposal

Pounds of solvent (A-A-857, MIL-T-81772) used per year: 840
Cost per pound: $2.10
Cost per year: $1,764

Rags used per year: 804
Pounds of rag waste per year: 10 (estimate)
Cost per pound: $2.10
Cost per year: $21.00

Total Annual Costs

Item	Cost
Consumables	$1,134.00
Labor	3,101.42
Waste Disposal	1,785.00
Total	$6,020.42

NELP METHOD: Paint Gun Washer Unit

Consumables

Gallons of solvent (A-A-857, MIL-T-81772) used per year: 10 (2 changeouts estimated)
New solvent cost per year: $175.60

Rags used per day: 2
Rags used per month: 17 (average)
Rags used per year: 204 rags
Cost per rag: $.10
Cost per year: $20.40

Labor

E-3 labor rate per hour: $10.39
Hours to manually clean parts per month: 7.2 (average)
Hours to manually clean parts per year: 86.4
Cost per year: $879.70/year

Waste Disposal

Pounds of solvent (A-A-857, MIL-T-81772) used per year: 140
Cost per pound: $2.10
Cost per year: $294

Rags used per year: 204
Pounds of rag waste per year: 2.5
Cost per pound: $2.10
Cost per year: $5.25

Total Annual Costs

Item	Cost
Consumables	$196.00
Labor	879.70
Waste Disposal	299.25
Total	$1,374.95

COST ANALYSIS SUMMARY (PER YEAR)

Manual Cleaning	$6020.42
Paint Gun Washer	$1,374.95
Cost Change	$4,645.47
Initial Procurement	$1,593.75
Expected Service Life	10 years
Return on Investment (per 10-year period)	$44,860.95 per unit [10 x $6,020.42] - [$1,593.75 + (10 x 1,374.95)]
Break Even	0.34 years [$1,593.75/($6020.42 - 1,374.95)]

PREPRODUCTION INITIATIVE-NELP
PAINT GUN WASHER
TEST PLAN

1.0 OBJECTIVE

This test plan describes the process data collection procedure for the paint gun washer. The data will be used to determine the system's efficiency, effectiveness, overall performance, and ability to interface successfully with site operations. Recommendations for fleetwide purchase will be based on your input.

2.0 DESCRIPTION

Currently, paint guns are washed by hand. The guns are scrubbed with thinner using cleaning rags. The automated paint gun washer unit will reduce consumption of cleaning solvents, decrease hazardous waste disposal costs, and minimize operator exposure to potentially harmful solvents.

The purpose of the 1-year test period is to:

- Verify that the paint gun washer increases productivity by cleaning more guns in a shorter amount of time
- Determine the cost-effectiveness of the unit
- Analyze the unit's ability to successfully interface with site operations.

3.0 TEST PLAN

This test plan will be used to evaluate the effectiveness of the paint gun washer unit compared to current manual washing methods.

3.1 Approach

Quantitative and qualitative data will be acquired by completion of Table 1.

3.1.1 Instructions for Completing Table 1

- **Date:** Indicate dates the paint gun washer was used (month and day).
- **Item Use**
  - **Paint Guns Washed:** List paint guns washed for each date entered.
  - **Quantity:** Indicate the quantity or volume of paint guns washed for each date entered.

  - **Frequency:** Indicate the frequency of usage on given date (*e.g.*, 1, 2, 3 times).

- **Quantity Solvent Used:** Indicate the quantity of solvent (*e.g.*, paint thinner) added and the date.

- **Time/Task:** Indicate the time required to complete one gun washing cycle, including loading and removing guns.

- **Waste Disposal:** Indicate the quantity of waste disposed of and the date.

- **Downtime/Month**

  - **Time Period:** Record time periods when the unit is not in use.

  - **Reason:** Explain whether downtime was due to repairs, maintenance, workload, or other factors.

- **Repair Time:** Indicate time required to repair the unit.

- **Repair Parts Required and Cost:** List repair parts required and their cost.

- **Consumables Ordered:** Record dates consumables were ordered, as well as the type, quantity, and cost.

- **Qualitative Assessment:** Provide a narrative evaluation of the cleaning abilities of the paint gun washer unit. Briefly discuss:

  - Efficiency of this method (*e.g.*, time and cost savings)

  - Ease of use and the unit's ability to successfully interface with site operations

  - Efficiency of waste disposal method

  - Overall satisfaction with the cleanliness of the parts (compared to parts washed by previous methods).

4.0 REPORTING

The data entry forms are a concise method of data collection. Forms should be completed on a daily basis. Data will be collected for 1 year. During this time, periodic status reports on the testing will be submitted to NAWCADLKE. The final report will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations.

Table 1

Date	Item Use			Quantity Solvent Used	Time/Task	Waste Disposal	Downtime/Month		Repair Time	Repair Parts Required and Cost
	Paint Guns Washed	Quantity	Frequency				Time Period	Reason		

Consumables Ordered

Date	Type	Quantity	Cost

Qualitative Assessment*:

Please comment on the effectiveness and efficiency of the unit.

___

___

___

___

*Attach extra sheet if required

PREPRODUCTION INITIATIVE-NELP
PAINT GUN WASHER
FINAL REPORT

NS MAYPORT, FL AND NAS NORTH ISLAND, CA

1.0 INTRODUCTION

The U.S. Navy has adopted a proactive and progressive position toward protecting the environment and complying with environmental laws and regulations. Rather than merely controlling and treating hazardous waste by end-of-the-pipe measures, the Navy has instituted a program for Pollution Prevention (P2) to reduce or eliminate the volume and toxicity of waste, air emissions, and effluent discharges.

P2 allows the Navy to meet or exceed current and future regulatory mandates and to achieve Navy-established goals for reducing hazardous waste generation and toxic chemical usage. P2 measures are implemented in a manner that maintains Navy readiness. An additional benefit has been a general increase in operational efficiency.

The Navy has truly set the standard for the procurement and implementation of P2 equipment. The Chief of Naval Operations (CNO), Environmental Protection, Safety, and Occupational Health Division (N45), established the P2 Equipment Program, through which both the Naval Air Warfare Center Lakehurst (NAWCADLKE) and the Naval Facilities Engineering Service Center (NFESC) serve as procurement agents under the direction of (N45). P2 equipment is specified and procured under two complementary initiatives, the Preproduction Initiative (*i.e.,* technology demonstration) and the Competitive Procurement Initiative. The Preproduction Initiative directly supports both the Navy Environmental Leadership Program (NELP) for P2 shore applications and the P2 Afloat program, which prototypes and procures P2 equipment specific to the needs of ships.

This report provides an analysis of the procurement, installation, and operation of P2 equipment under the Preproduction Initiative. Technology demonstrations and evaluation were primarily performed under NELP at two designated NELP sites, NAS North Island and NS Mayport. Additional sites have been added as required to meet mission goals. The program involves defining requirements, performing site surveys, procuring and installing equipment, training operators, and collecting data during an operational test period. The equipment is assessed for environmental benefits, labor and costs savings, and ability to interface with site operations.

2.0 BACKGROUND

Previously, paint guns at the NS Mayport and NAS North Island Aircraft Intermediate Maintenance Departments (AIMDs) were cleaned manually using toxic solvents such as toluene, xylene, methyl ethyl ketone (MEK), and acetone. These flammable solvents are a significant health hazard and source of hazardous waste.

The automated paint gun cleaning unit contains spray nozzles that blast the guns with solvent. During the test period, NAS North Island used MIL-T-81772, Type II; NS Mayport used A-A-857 and, later, MIL-T-81772, Type II. The paint guns require handling only when placed in or taken out of the automated unit, thereby eliminating prolonged contact with hazardous solvents or paint thinners. Because the solvent can be reused numerous times while in the unit, as opposed to wiping it on to the paint gun with rags, the requirement to dispose of large quantities of waste solvent is reduced. The tank is enclosed, and solvent volatile organic compound (VOC) emissions are insignificant. NAS North Island had previously used two other Graco paint gun washers as well as manual methods for cleaning.

The NELP goal was to implement a closed-loop system to recycle and reuse solvent in order to:

- Decrease the amount of rags and solvent used.
- Provide a healthier work environment.
- Effectively remove paint from guns while maintaining surface integrity of the paint gun components (gun and cup).
- Facilitate operation and maintenance.

Based on a comprehensive vendor search of parts cleaning units, the Graco Inc. Paint Gun Washer Model 112-636 was selected.

3.0 EQUIPMENT DESCRIPTION

3.1 Specifications

The automated paint gun washer flushes and cleans paint guns in less than 1 minute. The solvent is reused numerous times, thereby reducing waste. The closed-loop system complies with air quality regulations, including the South Coast Air Quality Management District (SCAQMD) Rule 1171 concerning VOCs. It handles solvent- and water-based coatings.

The unit weighs approximately 78 lb (dry) and has a 5-gallon solvent tank. The unit tank, lid, and fluid manifold are constructed of stainless steel. It has a hose wash and foot pedal lid opener. The unit is typically used to clean pressure feed, air spray, and HVLP guns; siphon air spray, air-assisted, and airless guns; and siphon and pressure cups. These standard gun supports can be customized with cleaning kits to match the type of guns or containers being washed.

3.2 Implementation Requirements

- Electric: No power requirements. The unit must be electrically grounded.
- Compressed air: 1/4 npt (f) air inlet
- Pressure operating range: 25 to 100 psi
- Optional 25-ft hose available to connect unit air inlet to shop airline
- Air pressure regulator, master air valve, 1/4 npt (m) coupler included for ease of installation

3.3 Benefits

- Reduces labor to clean paint guns versus manual methods.
- Reduces quantity of solvent used in cleaning process.
- Reduces costs by decreasing waste solvent, paint rags, and process time.
- Meets stringent air quality rules, including SCAQMD Rule 1171 for VOC emissions.

4.0 DATA ANALYSIS

Data was collected monthly from March 1995 through February 1996 at NS Mayport and March 1995 through January 1996 (provided as averaged data) at NAS North Island, based on the Operational Test Plan.

4.1 Quantitative Analysis

Compared with the manual paint gun cleaning process, the Model 112-636 paint gun washer has a return on investment (per 10-year period) of $44,860.95 per unit. The break-even point is 0.34 years. See Cost Analysis for complete data.

4.2 Qualitative Analysis

4.2.1 Installation

Site preparation for these units is minimal. Specific implementation requirements are provided in Section 3.0, Equipment Description.

4.2.2 Training

A 1-day training session was conducted to train all operators on the operation, safety, and maintenance of the unit. A complete installation, operation, and maintenance manual is shipped with each unit.

4.2.3 *Maintainability*

NS Mayport has reported no maintenance problems with this unit. It works well when used with the A-A-857 cleaning solvent and performs even better with MIL-T-81772. (The site stated that MIL-T-81772, Type II performs better on primers and polyurethane paints.)

NAS North Island, which uses the same types of paints, did not have satisfactory cleaning results. The site had to clean out and change solvent (5-gallon quantity) approximately once a week. The site also cleans paint guns using MIL-T-81772, Type II. The unit was checked to determine if any waste material was plugging the lines or pump, but none was found. The data for both sites was compared, but no major discrepancies were found in NAS North Island's method of operation. However, the frequency of usage (*i.e.*, average number of cycles per month) was almost twice that of NS Mayport.

Because NAS North Island uses the unit almost twice as often as NS Mayport, it was concluded that the solution needed changeout more often. To solve this problem, North Island retrofitted the unit with a filtration system manufactured by Gulf Coast Filters, Inc. Model #GCF-HRK-MOD. The element used within the filtration system is a common, inexpensive roll of paper towels. Although NAS North Island found no distinct advantage to the retrofitted filtration system to date and the P2 bulk procurement will not include it in the future, the equipment has proven effective in reducing waste from the cleaning process.

4.2.4 *Interface with Site Operations*

The units interfaced smoothly with the paint operation cleanup procedures at each site.

4.2.5 *Overall Performance*

NS Mayport is extremely satisfied with the results of the paint gun washer. It has reduced labor time, decreased the cost of consumables and rags, and created a healthier work environment.

NAS North Island is also pleased with the results of the paint gun washer. However, NAS North Island found little advantage to the retrofitted filtration system. Instead, as a P2 material substitution initiative, the site plans to switch to a water-based, non-toxic, zero VOC solvent.

5.0 LESSONS LEARNED

A specific site using a paint gun washer may not necessarily require a filtration system as indicated by the results of the two prototype sites. However, if the solvent does require frequent changeout, perhaps a solvent recycling/distillation system could be implemented in conjunction with collection of other used solvents on base. An additional variable to consider is the type of solvent used for cleaning. This should be determined based on the specific needs of each site.

6.0 CONCLUSIONS

Paint gun washers will provide several benefits over manual cleaning. The unit reduces the amount of labor and consumables required (*e.g.,* solvent and rags). As a result, the disposal costs of rags and spent solvent are greatly reduced. Spent solvent is disposed of when the solvent is changed out of the unit. The frequency is based on the unit usage rate, but the quantity of solvent is drastically reduced when compared with manual cleaning. The used paper towel filters (less than $2 each) must be disposed of in the case of the retrofitted filtration system.

The unit provides a safer working environment, because it requires minimal operator exposure to the solvent (*i.e.,* when unloading washed guns after a cycle, replenishing the unit with solvent, and replacing and disposing of the spent filters). This results in a much healthier work environment.

PREPRODUCTION INITIATIVE-NELP
PARTICLE CONTAMINATION MONITOR
GENERAL DESCRIPTION

P2 Opportunity: Reduce use of P-D-680 solvent and waste fluid associated with patch test contamination measurement of aircraft hydraulic fluids.

Equipment Description: The HIAC/ROYCO particle counter System 8011 is a benchtop unit comprised of three components: Model 8000A digital counter with printer, ABS-2 automatic bottle sampler, and HRLD-400HC liquid sensor, which incorporates laser diode technology. The system measures particulate contamination without requiring solvent dilution of the fluid.

Implementation Requirements:

- Electrical: 115V, 60 Hz, 1 phase
- Size: Model 8000A: 16" x 12" x 6.5" high, 12 lb.
  ABS-2: 18" x 12.75" x 27" high, 50 lb.
  HRLD-400HC: 4" x 1.5" x 1.5" high, 1.1 lb.

Benefits:

- Eliminate the need for solvent (P-D-680) dilution of hydraulic fluids.
- Reduce the amount of waste fluid.
- Reuse specimen fluid by adding to similar fluids for reconditioning using hydraulic purifiers.
- Achieve objective particle counts.
- Reduce process time to obtain measurements.
- Provide record of data measurements.
- Provide user-defined output data format.

Other Information:

- System is applicable to other fluids when using compatible sensors.
- System requires semiannual calibration.
- Optional standards for measurement are NAS 1638, ISO, MIL-STD-1646A, FED-STD-209D, and user.

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Vendor(s): Pacific Scientific — Model: 8011
HIAC/ROYCO

FY/Site(s): 1994 NELP Initiative, NAS North Island, NS Mayport

Cost: $42,488 (2 units)

PREPRODUCTION INITIATIVE-NELP
PARTICLE CONTAMINATION MONITOR
COST ANALYSIS

PROTOTYPE SITES: NAS North Island, NS Mayport

DESCRIPTION: Electronically determines the contamination level of fluids and provides printouts of "nonsubjective" measurements. This type of measurement will replace the patch test method at the intermediate maintenance departments to determine the contamination level of aviation hydraulic fluids.

DATA COLLECTION PERIOD: June 1995 - May 1996

COST SAVINGS: The particle counter reduces waste disposal costs and labor hours by eliminating the patch test method for determining contamination.

PREVIOUS METHOD: Patch Test

Consumables

Milliliters of P-D-680 Type II used per test: 115
Cost per milliliter: $0.000685
Cost of P-D-680 Type II per test: $0.08
Number of filters used per test: 1 filter
Cost per filter: $0.56
Number of Petri slides used per test: 1
Cost per Petri slide: $0.19
Number of tests per month: 55
Number of tests per year: 660
Total cost per test: $0.83
Total cost per year: $547.80

Labor

E-3 labor rate per hour: $10.39
Time per "dry" patch test: 1 hour
Tests per year: 660
Total cost per year: $6,857.40

Waste Disposal

Waste to be disposed of: Oil consisting of mixed P-D-680 Type II and hydraulic fluid
Milliliters of waste generated per test: 230
Gallons of waste generated per year: 40
Pounds per gallon: 6.5 (estimated)
Cost per pound: $2.10
Cost per year: $546.00

Rags: Not included

Total Annual Costs

Item	Cost
Consumables	$547.80
Labor	6,857.40
Waste Disposal	546.00
Total	$7,951.20

NELP METHOD: Electronic Particle Counter

Note: Time spent waiting for completion of particle counter cycle and time to transport sample is not included due to low daily usage (660 tests per 360 days = 1.8 tests/day).

Consumables

Cost of printer paper per test: $0.16
Cost of printer ribbon per test: $0.48
Number of tests per year: 660
Cost of printer supplies per year: $422.40

Calibrations required per year: 2
Cost per calibration fluid: $64.75
Cost per year (includes 10% discount): $116.55 (based on unit currently under contract)

Total cost per year: $538.95

Labor

E-3 labor rate per hour: $10.39
Minutes per test: 8.5
Cost per test: $1.47
Number of tests per year: 660
Cost per year: $970.20

Waste Disposal

Milliliters of hydraulic fluid generated per test: 115
Gallons of waste generated per year: 20
Disposal cost: $.00 (recycle with Hydraulic Purifier)
Rags: Not included

Total Annual Costs

Item	Cost
Consumables	$538.95
Labor	970.20
Waste Disposal	0.00
Total	$1,509.15

COST ANALYSIS SUMMARY (PER YEAR)

Patch Test	$7,951.20
Electronic Particle Counter	$1,509.15
Cost Change	$6,442.05
Initial Procurement	$7,500.00
(Cost of particle counter under current contract)	
Expected Service Life	10 years
Return on Investment (per 10-year period)	$56,920.50 per unit [(10 x $7,951.20)] - [$7,500 + (10 x $1,509.15)]
Break Even	1.16 years [$7,500.00/$6,442.50]

Notes: For activities using a 15-minute patch test cycle; ROI would decrease to $5,477.30; payback period would increase to 5.78 years.

Labor hours denote the time required to perform a “dry” patch test (in accordance with technical publication NAVAIR 17-115E-52) versus the wet patch, which is performed for expediency and takes approximately 15 minutes.

Activities performing dry patch tests only, in accordance with the technical publication NAVAIR 17-115E-52, benefit the most because approximately 86% of the cost of each patch test is labor. The labor test time will reduce from 1 hour required for a dry patch test to approximately 8.5 minutes using an electronic particle counter. I-level activities with higher usage rates would achieve additional savings.

Use of the particle counter would reduce the wastestream by 50% (from 40 gallons to 20 gallons) and change the wastestream from a mixture of P-D-680 and hydraulic fluid to hydraulic fluid only. This hydraulic fluid wastestream has a potential for further volume reduction if the fluid is satisfactory for inclusion with identical fluid destined for processing using a hydraulic fluid purifier (*e.g.*, Hydraulic International Model HPU-1-5).

Initial and consumable costs are not based on the particle counters procured for NELP sites but reflect costs of the UCC, Inc., Model CM20/BS particle counter. UCC was awarded the contract for particle counters to replace the patch test. The UCC unit is similar to the Diagnetics dCA and HIAC/ROYCO 8011 particle counters with regard to operation time and cost. Thus, data gathered at NELP sites using both the Diagnetics dCA and the HIAC/ROYCO 8011 units will apply to the UCC unit as well.

PREPRODUCTION INITIATIVE-NELP
PARTICLE CONTAMINATION MONITOR
TEST PLAN

1.0 OBJECTIVE

This test plan describes the data collection procedures for acquiring performance data on two particle counter models, analyzing the data in conjunction with conventional patch test data of the same fluid sample over a multitude of samples, and evaluating the units to obtain the particulate measurements of aircraft hydraulic fluid in lieu of the present patch test method.

2.0 DESCRIPTION

Currently, aircraft hydraulic fluid particulate contamination is determined using the patch test method defined in NAVAIR 01-01A-17. This method is time-consuming, requires solvents, generates waste, and requires a subjective decision. Thus, particle counters are being evaluated to determine whether these units are more effective than the current method.

Synthetic aircraft hydraulic fluids MIL-H-83282 (Hydraulic Fluid, Fire-Resistant) and MIL-H-46170 (Hydraulic Fluid, Rust-Inhibited, Fire-Resistant) are the primary fluids to be measured.

3.0 TEST PLAN

This test plan defines procedures for acquiring test data, which will be used to evaluate the performance of two particle counter systems—HYAC/ROYCO 8011 and Diagnetics Digital Contam-Alert (dCA). Although each system uses a different technology for measuring particulates, the test plan procedures apply to both.

3.1 Approach

The HYAC/ROYCO 8011 will be used to measure contaminant levels in MIL-H-83282 hydraulic fluid used in aircraft and the A/M27T-5 hydraulic power supply. The dCA system will measure MIL-H-46170 hydraulic fluid used in hydraulic test stands. Although these are the fluids intended for use in the particle counters at this Aircraft Intermediate Maintenance Department (AIMD) activity, they can be interchanged because each particle counter is capable of measuring particulate in either fluid.

Fluid samples will be measured using the particle counters, and the results will be correlated with the results obtained from the conventional patch test using the same fluid sample.

3.1.1 Requirements

- **Particle Counter:** The particle counter shall be within its calibration cycle and operated by qualified personnel.

- **Fluid Sample Bottle:** The following containers are acceptable for fluid collection:

  - **Flint Glass Bottle:** National Stock Number (NSN) 8123-00-543-7699

  - **Plastic Sample Bottle:** Part Number (P/N) XX6504709 (from Contamination Analysis Kit, P/N 57L414)

  Fluid samples shall be drawn from a clean sampling port on the equipment or from a fabricated reservoir.

- **Waste Receptacles:** The following shall be kept in separate receptacles:

  - Waste hydraulic fluid
  - Waste hydraulic fluid-containing solvent
  - Waste solvent.

3.1.2 Procedures

The following procedures describe how to collect fluid test samples from a sample port. Procedures are also provided for testing fluid samples using particle counters. Data related to these samples will be used to evaluate the performance of the particle counters compared to patch tests.

Procedure for Taking Hydraulic Fluid Samples from Sampling Ports (*e.g.*, A/M27T-5 Hydraulic Power Supply)

1. Determine the fitting to be used as a sampling port.

2. Prepare the sample port as follows.

   a. Remove dirt and other external contaminants from the sampling point by washing it with cleaning solvent P-D-680, Type II. Dispense the solvent from a non-filtered wash bottle. Wipe the sampling point clean using disposable wiping cloths.

   b. When the sampling port is visibly clean and free of external contaminants, perform a final solvent wash using the wash bottle. Allow it to dry.

3. Before sampling the support equipment hydraulic system fluid, recirculate the fluid within the system for a minimum of 5 minutes at full flow (or proportionally longer at a lower flow rate).

4. To collect a fluid sample, follow these procedures.

a. Remove the specimen label from the previous fluid sample.

b. Drain the sample bottle of any hydraulic fluid remaining from the previous sample into a waste receptacle or use a new sample bottle. Do not rinse the sample bottle with solvent.

c. Initiate the flow of hydraulic fluid from the sampling port of the hydraulic supply. Allow a purge quantity of approximately five times the stagnant volume to flow into a waste receptacle.

d. Rinse the sample bottle with system fluid. After purging the dead volume, fill it half-full with fluid collected from the sampling port. Cap the bottle and shake it for at least 1 minute. Drain the bottle into the waste receptacle.

CAUTION: Sampling ports and bottles that are inadequately cleaned will result in erroneous test results, which may cause the system to fail the test.

e. Without interrupting the fluid flow from the sampling port initiated in step d, fill the rinsed sample bottle to its appropriate level, remove it from the fluid stream, and cap the bottle. Do not completely fill the sampling bottle.

   – **Fluid Level for Flint Glass:** Approximately 1 inch (25 mm) below the shoulder

   – **Fluid Level for Plastic Bottle:** Approximately 1/4 inch (6 mm) below the shoulder

f. Terminate the fluid flow from the sampling port.

g. Turn off the power supply system's main engine.

h. Wipe the exterior of the capped bottle using isopropyl alcohol, or equivalent, and let dry.

i. Affix a tag to the filled sample bottle that identifies the following:

   – The date the sample was taken
   – Equipment nomenclature from which the sample was taken (*i.e.*, AIMD work center or squadron)—including unit identification code (UIC)
   – Point of contact (POC) and phone number

j. Analyze the hydraulic fluid drawn from the sample port for particulate contamination. Enter the results in Table 1.

k. Complete the data entries requested in Table 1 and as described in section 3.1.3.

5. Complete all remaining data entries requested in Table 1 and as described in section 3.1.3.

Procedures for Personnel Performing Particle Counter Testing

1. Calibrate the particle counter using the procedures set forth by the manufacturer and at the frequency recommended by the manufacturer.

2. Visually inspect the fluid sample. Fluid with visible particles or visible evidence of water should be rejected because visibly contaminated hydraulic fluid can clog and damage the sensor, leading to incorrect data on subsequent samples.

3. Shake the sample bottle vigorously for a minimum of 1 minute.

4. Measure the particle count following the manufacturer's instructions.

NOTE: The HYAC/ROYCO 8011 particle counter is sensitive to air bubbles. Follow the manufacturer's procedures for removing air bubbles to avoid erroneous particle counts.

5. Perform a particle count analysis on the sample fluid from the same sample bottle using patch test contamination kit P/N 57L414. Drain waste fluids into the appropriate receptacles.

6. Compare the results obtained from the particle counter and from the patch test analysis. If they do not agree, the patch test results shall take precedence.

7. Record all test data in Table 1.

8. Return the emptied sample bottle to the originator.

3.1.3 Instructions for Completing Table 1

- **Sample Number:** Indicate sample number.

- **Sample Date:** Indicate the dates the fluid sample was taken (month/day/year).

- **Work Center:** Indicate the center performing the task.

- **Equipment Nomenclature:** Describe the hydraulic supply from which the sample was drawn.

- **Particle Counter:** Indicate the NS class of the fluid particulate measured and whether it is NS class 5 or less ("pass") or greater than class 5 ("fail"). Indicate the presence/absence of water.

- **Patch Test:** Indicate the NS class of the fluid particulate measured and whether it is NS class 5 or less (“pass”) or greater than class 5 (“fail”). Indicate the presence/absence of water.

- **Test Date:** Record the date when the fluid particulate was measured using a particle counter and/or a patch test (month/day/year).

- **Point of Contact (POC):** List the POC and the technician responsible for measurement.

- **Qualitative Assessment:** Provide a brief narrative evaluation of the abilities of the particle counter and particle contamination monitor. Briefly discuss:

  - Efficiency of the method (*e.g.*, time and cost savings)
  - Ease of use and the unit’s ability to successfully interface with site operations
  - Overall satisfaction.

3.1.4 Supplemental Data

Supplemental data required for the evaluation includes the prevailing temperature and relative humidity measured at the station during the process. Both of these affect the time required for reducing the amount of dissolved water in the hydraulic fluid.

4.0 REPORTING

The data entry forms are a concise method of data collection. Forms should be completed on a daily basis. Data will be collected for 1 year. During this time, periodic status reports on the testing will be submitted to NAWCADLKE. The final report will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations.

Table 1

Sample Number	Sample Date	Work Center	Equipment Nomenclature	Particle Counter	Patch Test	Test Date	POC	Prevailing Temperature	Relative Humidity

Qualitative Assessment*:
Please comment on the effectiveness and efficiency of the unit.

____

____

____

____

*Attach extra sheet if required.

PREPRODUCTION INITIATIVE-NELP
PARTICLE CONTAMINATION MONITOR
FINAL REPORT

NS MAYPORT, FL AND NAS NORTH ISLAND, CA

1.0 INTRODUCTION

The U.S. Navy has adopted a proactive and progressive position toward protecting the environment and complying with environmental laws and regulations. Rather than merely controlling and treating hazardous waste by end-of-the-pipe measures, the Navy has instituted a program for Pollution Prevention (P2) to reduce or eliminate the volume and toxicity of waste, air emissions, and effluent discharges.

P2 allows the Navy to meet or exceed current and future regulatory mandates and to achieve Navy-established goals for reducing hazardous waste generation and toxic chemical usage. P2 measures are implemented in a manner that maintains Navy readiness. An additional benefit has been a general increase in operational efficiency.

The Navy has truly set the standard for the procurement and implementation of P2 equipment. The Chief of Naval Operations (CNO), Environmental Protection, Safety, and Occupational Health Division (N45), established the P2 Equipment Program, through which both the Naval Air Warfare Center Lakehurst (NAWCADLKE) and the Naval Facilities Engineering Service Center (NFESC) serve as procurement agents under the direction of (N45). P2 equipment is specified and procured under two complementary initiatives, the Preproduction Initiative (*i.e.*, technology demonstration) and the Competitive Procurement Initiative. The Preproduction Initiative directly supports both the Navy Environmental Leadership Program (NELP) for P2 shore applications and the P2 Afloat program, which prototypes and procures P2 equipment specific to the needs of ships.

This report provides an analysis of the procurement, installation, and operation of P2 equipment under the Preproduction Initiative. Technology demonstrations and evaluation were primarily performed under NELP at two designated NELP sites, NAS North Island and NS Mayport. Additional sites have been added as required to meet mission goals. The program involves defining requirements, performing site surveys, procuring and installing equipment, training operators, and collecting data during an operational test period. The equipment is assessed for environmental benefits, labor and costs savings, and ability to interface with site operations.

2.0 BACKGROUND

Maintenance of aircraft hydraulic fluid related to ground support equipment (GSE) is currently accomplished using the contamination analysis kit patch test method. This is the primary contamination measurement method used at all levels of maintenance within the fleet. However, on a day-to-day basis, this method is time-consuming and generates additional hydraulic fluid waste because of solvent contamination. In addition, interpretation of the fluid contamination data is subjective.

In view of Navy P2 goals, another method for measuring fluid particulate contamination in aircraft hydraulic fluid that does not require the use of solvents and is cost-effective is highly desirable. Electronic particle counters have the potential to achieve these goals. At least one of these types of devices has been authorized for depot-level maintenance as noted in the Aviation Hydraulics Manual (NAVAIR 01-1A-17, paragraph 2-26); however, its applications regarding P2 and Fleet Aircraft Intermediate Maintenance Departments (AIMDs) have not been substantiated.

Ten particle counter and particle contamination monitor systems were reviewed. Two of these, HIAC/ROYCO 8011 and Diagnetics Digital Contam-Alert (dCA), were selected for evaluation because they were considered to have the most potential to support the Navy aircraft hydraulic contamination control program and P2 goals. The hydraulic fluids of immediate and primary interest were MIL-H-46170 and MIL-H-83282.

Both systems are located at the AIMD activities at NAS North Island and NS Mayport. These activities provided the support and measurement data necessary to evaluate the effectiveness of the systems.

3.0 EQUIPMENT DESCRIPTION

The specifications, implementation requirements, and benefits of the HIAC/ROYCO 8011 and Diagnetics dCA systems are provided in the following paragraphs.

3.1 Specifications

The specifications of the HIAC/ROYCO 8011 and Diagnetics dCA systems follow.

3.1.1 HIAC/ROYCO 8011

The HIAC/ROYCO 8011 system is bench-mounted and is comprised of three units: the Model 8000A counter, an automatic bottle sampler (ABS-2), and a laser diode sensor (HRLD-400C). User-selectable printed data formats produced by the model 8000A counter are ISO, NAS1638, MIL-STD-1246A, USP<778>, and 209D. Technology used for the optical systems includes light-obscuring sensors/laser-illuminated diode and photo diode detector. Software can be downloaded to a standard computer, allowing further data evaluation. Utility requirements for system operation are 110 VAC at 60 Hz and pressurized air at 10 to 60 psi.

3.1.2 Diagnetics dCA

The Diagnetics dCA system is a portable device consisting of a fluid sensor interconnected with a hand-held portable condition monitor (PCM) (computer) with printer and a small portable pressure chamber. The PCM displays the fluid particle count measurement data from the dCA in a user-selectable format (*e.g.*, ISO, SAE, and NAS class), gravimetric equivalents, and particle counts greater than 5, 10, and 15 microns. The PCM data, with appropriate software, can be downloaded to a standard computer, allowing further data evaluation.

The technology used by the sensor is mesh obscuration. Utility requirements for system operation are 110 VAC at 60 Hz and pressurized air at 60 to 120 psi.

3.2 Implementation Requirements

The implementation requirements for the HIAC/ROYCO 8011 and Diagnetics dCA systems follow.

3.2.1 HIAC/ROYCO 8011

- Electrical: 115V, 60 Hz, 1 phase
- Pressurized air: 10 to 60 psi
- Size:
  - Model 8000A Counter: 12" wide x 16" deep x 6.5" high; 12 lb
  - ABS-2: 12' wide x 18" deep x 27" high; 50 lb
  - HRLD-400C Laser Diode Sensor: 1.5" wide x 4" deep x 1.5" high; 1.1 lb

3.2.2 Diagnetics dCA

- Electrical: 115V, 60 Hz, 1 phase
- Pressurized Air: 60 to 120 psi
- Size:
  - PCM with Printer and Pressure Chamber: 4.5" wide x 2" deep x 1" high; <5 lb
  - dCA Sensor Probe Assembly: 2" diameter x 11" long; approximately 1.5 lb

3.3 Benefits

The benefits of the HIAC/ROYCO 8011 and Diagnetics dCA systems are as follows:

- Eliminate the need for solvent (P-D-680) dilution of hydraulic fluids.
- Reduce the volume of waste hydraulic fluid.
- Reclaim specimen fluid by combining with similar fluid for processing using a hydraulic purifier.
- Achieve objective particle counts as data printout.
- Reduce measurement process time.
- Provide user-selectable output data format

4.0 DATA ANALYSIS

Data was collected monthly from August 1995 through May 1996 at NS Mayport, and from June 1995 through January 1996 at NAS North Island in accordance with the Operational Test Plan. Each site activity received one HIAC/ROYCO 8011 and one Diagnetics dCA system. The data obtained is sufficient to support the conclusions and recommendations in this report.

The delivery, training, and warranty expiration dates for both systems are provided in Table 1.

TABLE 1. CHRONOLOGY

System	Delivery Date	Training Date	Warranty Expiration Date
NS Mayport			
☞ HIAC/ROYCO 8011	1 November 1994	14 December 1994/ 28 April 1995	1 November 1995
☞ Diagnetics dCA	28 November 1994	12-13 January 1995	1 December 1995
NAS North Island			
☞ HIAC/ROYCO 8011	4 November 1994	10 November 1994	1 November 1995
☞ Diagnetics dCA	28 November 1994	2 December 1994	1 December 1995

The Test Plan describes the procedures to collect performance data for the systems. Initially, each activity compiled particle counter and corresponding patch test data for the fluid sample. This procedure continued until equipment operators became proficient in using the particle counter and particle contamination monitor systems, as was evident from a comparison of both data sets.

4.1 Quantitative Analysis

Test data obtained from the two activities are summarized in Table 2 and represent the number of particle count measurements made subsequent to authorization by the Naval Air Systems Command (NAVAIR) for use of the particle counter and particle contamination monitor system in lieu of the patch test at each AIMD. However, the patch test remains the primary contamination measurement method.

TABLE 2. TEST DATA

System	Site	Number Of Measurements	End Date
HIAC/ROYCO 8011	NS Mayport	306	May 1996
	NAS North Island	319	January 1996
Diagnetics dCA	NS Mayport	346	May 1996
	NAS North Island	217	January 1996

The system has a return on investment (per 10-year period) of $56,920.50, with the break even point occurring in 1.16 years.

The Cost Analysis incorporates the following assumptions:

- System cost is $7,500 (cost of UCC particle counter presently under competitive contract).
- Standard dry patch test takes approximately 1 hour to complete using an E-3 labor rate.
- Fifty-five particulate contamination measurements are taken per month.
- The NAS North Island and NS Mayport data apply.

4.2 Qualitative Analysis

Based on comments provided on the data sheets, the operational performance of each system is considered satisfactory for its intended use. It should be noted that these systems are applicable to fluids other than hydraulic oils as cited in each equipment manual.

4.2.1 Installation

Interfacing the particle counter systems to the site facilities was straightforward and without problems.

4.2.2 Training

Training was conducted on site by the manufacturers' representatives. The site activities reported that the training sessions were satisfactory. HIAC/ROYCO returned to NS Mayport a second time to enhance the original training session.

4.2.3 Maintainability

There were no major problems reported by the activities regarding the maintainability of the electronic particle counter systems. The HIAC/ROYCO 8011 at NS Mayport required some replacement parts at the start of the test period (See 4.2.5.1).

4.2.4 Interface With Site Operations

Both particle counter systems measure particulate contamination in aircraft hydraulic fluid and provide essentially the same environmental and cost benefits.

4.2.5 Overall Performance

The total number of measurements taken by these systems was too small to determine their reliability; however, periodic measurements were made using fluid of a known contamination to substantiate equipment calibration.

The usage data and service time were not sufficient to extract reliability data. NS Mayport, however, reported a minor difficulty with the HIAC/ROYCO 8011, which was subsequently rectified by the manufacturer.

4.2.5.1 <u>HIAC/ROYCO 8011</u>

The HIAC/ROYCO 8011 at NAS North Island had no problems. However, the HIAC/ROYCO 8011 at NS Mayport required the following items be replaced under warranty:

- ABS-2 pick-up tube replaced with a longer unit (August 1995).

- Desiccant chamber and in-line filter replaced (September 1995).

4.2.5.2 <u>Diagnetics dCA</u>

Neither activity reported any problems with the Diagnetics dCA.

5.0 LESSONS LEARNED

- Inventory of common spare parts (*e.g.*, in-line filters, desiccant chamber, and fuses) at the user level to preclude excessive downtime of the system.

- Do not store calibration kits in large quantities because these kits contain fluids with known particulates to simulate contamination and have a shelf life.

- Use calibration verification fluid only once. After the first use, the fluid certification regarding the remaining fluid is invalid because of potential contamination from particulates and moisture.

6.0 CONCLUSIONS

- The waste mixture of hydraulic oil and solvent P-D-680 resulting from the patch test process will be reduced by at least 50% in volume, and the waste will be comprised of hydraulic oil only.

- The volume of hydraulic oil waste resulting from particle counter measurements can potentially be eliminated if the maintenance activity uses a hydraulic oil purifier equivalent to the HII's Model HPU-1-5, which was also evaluated under NELP; however, the oil should not contain any contaminants prohibited by the appropriate purifier operations/maintenance manual.

- The cycle time required to conduct the particulate measurement process and obtain data is reduced from approximately 60 minutes required by the existing dry patch method to approximately 8.5 minutes when using a particle counter.

- Cost and environmental savings to Navy activities will be realized when devices of this type are adapted and used in lieu of the patch test for performing routine measurements at all maintenance levels.

The following actions are recommended:

- Use an electronic particle counter system to supplement the existing patch test at all Navy maintenance levels.

- Use the patch test as the primary method to determine hydraulic fluid particulate contamination.

PREPRODUCTION INITIATIVE-NELP
PARTICLE COUNTER
GENERAL DESCRIPTION

P2 Opportunity: Reduce use of P-D-680 solvent and waste fluid associated with patch test contamination measurement of aircraft hydraulic fluids.

Equipment Description: The HIAC/ROYCO particle counter System 8011 is a benchtop unit comprised of three components: Model 8000A digital counter with printer, ABS-2 automatic bottle sampler, and HRLD-400HC liquid sensor, which incorporates laser diode technology. The system measures particulate contamination without requiring solvent dilution of the fluid.

Implementation Requirements:

- Electrical: 115V, 60 Hz, 1 phase
- Size: Model 8000A: 16" x 12" x 6.5" high, 12 lb.
  ABS-2: 18" x 12.75" x 27" high, 50 lb.
  HRLD-400HC: 4" x 1.5" x 1.5" high, 1.1 lb.

Benefits:

- Eliminate the need for solvent (P-D-680) dilution of hydraulic fluids.
- Reduce the amount of waste fluid.
- Reuse specimen fluid by adding to similar fluids for reconditioning using hydraulic purifiers.
- Achieve objective particle counts.
- Reduce process time to obtain measurements.
- Provide record of data measurements.
- Provide user-defined output data format.

Other Information:

- System is applicable to other fluids when using compatible sensors.
- System requires semiannual calibration.
- Optional standards for measurement are NAS 1638, ISO, MIL-STD-1646A, FED-STD-209D, and user.

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Vendor(s): Pacific Scientific Model: 8011
HIAC/ROYCO

FY/Site(s): 1994 NELP Initiative, NAS North Island, NS Mayport

Cost: $42,488 (2 units)

PREPRODUCTION INITIATIVE-NELP
PARTICLE COUNTER
COST ANALYSIS

PROTOTYPE SITES: NAS North Island, NS Mayport

DESCRIPTION: Electronically determines the contamination level of fluids and provides printouts of “nonsubjective” measurements. This type of measurement will replace the patch test method at the intermediate maintenance departments to determine the contamination level of aviation hydraulic fluids.

DATA COLLECTION PERIOD: June 1995 - May 1996

COST SAVINGS: The particle counter reduces waste disposal costs and labor hours by eliminating the patch test method for determining contamination.

PREVIOUS METHOD: Patch Test

Consumables

Milliliters of P-D-680 Type II used per test: 115
Cost per milliliter: $0.000685
Cost of P-D-680 Type II per test: $0.08
Number of filters used per test: 1 filter
Cost per filter: $0.56
Number of Petri slides used per test: 1
Cost per Petri slide: $0.19
Number of tests per month: 55
Number of tests per year: 660
Total cost per test: $0.83
Total cost per year: $547.80

Labor

E-3 labor rate per hour: $10.39
Time per “dry” patch test: 1 hour
Tests per year: 660
Total cost per year: $6,857.40

Waste Disposal

Waste to be disposed of: Oil consisting of mixed P-D-680 Type II and hydraulic fluid
Milliliters of waste generated per test: 230
Gallons of waste generated per year: 40
Pounds per gallon: 6.5 (estimated)
Cost per pound: $2.10
Cost per year: $546.00

Rags: Not included

Total Annual Costs

Item	Cost
Consumables	$547.80
Labor	6,857.40
Waste Disposal	546.00
Total	$7,951.20

NELP METHOD: Electronic Particle Counter

Note: Time spent waiting for completion of particle counter cycle and time to transport sample is not included due to low daily usage (660 tests per 360 days = 1.8 tests/day).

Consumables

Cost of printer paper per test: $0.16
Cost of printer ribbon per test: $0.48
Number of tests per year: 660
Cost of printer supplies per year: $422.40

Calibrations required per year: 2
Cost per calibration fluid: $64.75
Cost per year (includes 10% discount): $116.55 (based on unit currently under contract)

Total cost per year: $538.95

Labor

E-3 labor rate per hour: $10.39
Minutes per test: 8.5
Cost per test: $1.47
Number of tests per year: 660
Cost per year: $970.20

Waste Disposal

Milliliters of hydraulic fluid generated per test: 115
Gallons of waste generated per year: 20
Disposal cost: $.00 (recycle with Hydraulic Purifier)
Rags: Not included

Total Annual Costs

Item	Cost
Consumables	$538.95
Labor	970.20
Waste Disposal	0.00
Total	$1,509.15

COST ANALYSIS SUMMARY (PER YEAR)

Patch Test	$7,951.20
Electronic Particle Counter	$1,509.15
Cost Change	$6,442.05
Initial Procurement	$7,500.00
(Cost of particle counter under current contract)	
Expected Service Life	10 years
Return on Investment (per 10-year period)	$56,920.50 per unit [(10 x $7,951.20)] - [$7,500 + (10 x $1,509.15)]
Break Even	1.16 years [$7,500.00/$6,442.50]

Notes: For activities using a 15-minute patch test cycle; ROI would decrease to $5,477.30; payback period would increase to 5.78 years.

Labor hours denote the time required to perform a "dry" patch test (in accordance with technical publication NAVAIR 17-115E-52) versus the wet patch, which is performed for expediency and takes approximately 15 minutes.

Activities performing dry patch tests only, in accordance with the technical publication NAVAIR 17-115E-52, benefit the most because approximately 86% of the cost of each patch test is labor. The labor test time will reduce from 1 hour required for a dry patch test to approximately 8.5 minutes using an electronic particle counter. I-level activities with higher usage rates would achieve additional savings.

Use of the particle counter would reduce the wastestream by 50% (from 40 gallons to 20 gallons) and change the wastestream from a mixture of P-D-680 and hydraulic fluid to hydraulic fluid only. This hydraulic fluid wastestream has a potential for further volume reduction if the fluid is satisfactory for inclusion with identical fluid destined for processing using a hydraulic fluid purifier (*e.g.*, Hydraulic International Model HPU-1-5).

Initial and consumable costs are not based on the particle counters procured for NELP sites but reflect costs of the UCC, Inc., Model CM20/BS particle counter. UCC was awarded the contract for particle counters to replace the patch test. The UCC unit is similar to the Diagnetics dCA and HIAC/ROYCO 8011 particle counters with regard to operation time and cost. Thus, data gathered at NELP sites using both the Diagnetics dCA and the HIAC/ROYCO 8011 units will apply to the UCC unit as well.

PREPRODUCTION INITIATIVE-NELP
PARTICLE COUNTER
TEST PLAN

1.0 OBJECTIVE

This test plan describes the data collection procedures for acquiring performance data on two particle counter models, analyzing the data in conjunction with conventional patch test data of the same fluid sample over a multitude of samples, and evaluating the units to obtain the particulate measurements of aircraft hydraulic fluid in lieu of the present patch test method.

2.0 DESCRIPTION

Currently, aircraft hydraulic fluid particulate contamination is determined using the patch test method defined in NAVAIR 01-01A-17. This method is time-consuming, requires solvents, generates waste, and requires a subjective decision. Thus, particle counters are being evaluated to determine whether these units are more effective than the current method.

Synthetic aircraft hydraulic fluids MIL-H-83282 (Hydraulic Fluid, Fire-Resistant) and MIL-H-46170 (Hydraulic Fluid, Rust-Inhibited, Fire-Resistant) are the primary fluids to be measured.

3.0 TEST PLAN

This test plan defines procedures for acquiring test data, which will be used to evaluate the performance of two particle counter systems—HYAC/ROYCO 8011 and Diagnetics Digital Contam-Alert (dCA). Although each system uses a different technology for measuring particulates, the test plan procedures apply to both.

3.1 Approach

The HYAC/ROYCO 8011 will be used to measure contaminant levels in MIL-H-83282 hydraulic fluid used in aircraft and the A/M27T-5 hydraulic power supply. The dCA system will measure MIL-H-46170 hydraulic fluid used in hydraulic test stands. Although these are the fluids intended for use in the particle counters at this Aircraft Intermediate Maintenance Department (AIMD) activity, they can be interchanged because each particle counter is capable of measuring particulate in either fluid.

Fluid samples will be measured using the particle counters, and the results will be correlated with the results obtained from the conventional patch test using the same fluid sample.

3.1.1 Requirements

- **Particle Counter:** The particle counter shall be within its calibration cycle and operated by qualified personnel.

- **Fluid Sample Bottle:** The following containers are acceptable for fluid collection:

  - **Flint Glass Bottle:** National Stock Number (NSN) 8123-00-543-7699

  - **Plastic Sample Bottle:** Part Number (P/N) XX6504709 (from Contamination Analysis Kit, P/N 57L414)

  Fluid samples shall be drawn from a clean sampling port on the equipment or from a fabricated reservoir.

- **Waste Receptacles:** The following shall be kept in separate receptacles:

  - Waste hydraulic fluid
  - Waste hydraulic fluid-containing solvent
  - Waste solvent.

3.1.2 Procedures

The following procedures describe how to collect fluid test samples from a sample port. Procedures are also provided for testing fluid samples using particle counters. Data related to these samples will be used to evaluate the performance of the particle counters compared to patch tests.

Procedure for Taking Hydraulic Fluid Samples from Sampling Ports (*e.g.*, A/M27T-5 Hydraulic Power Supply)

1. Determine the fitting to be used as a sampling port.

2. Prepare the sample port as follows.

   a. Remove dirt and other external contaminants from the sampling point by washing it with cleaning solvent P-D-680, Type II. Dispense the solvent from a non-filtered wash bottle. Wipe the sampling point clean using disposable wiping cloths.

   b. When the sampling port is visibly clean and free of external contaminants, perform a final solvent wash using the wash bottle. Allow it to dry.

3. Before sampling the support equipment hydraulic system fluid, recirculate the fluid within the system for a minimum of 5 minutes at full flow (or proportionally longer at a lower flow rate).

4. To collect a fluid sample, follow these procedures.

a. Remove the specimen label from the previous fluid sample.

b. Drain the sample bottle of any hydraulic fluid remaining from the previous sample into a waste receptacle or use a new sample bottle. Do not rinse the sample bottle with solvent.

c. Initiate the flow of hydraulic fluid from the sampling port of the hydraulic supply. Allow a purge quantity of approximately five times the stagnant volume to flow into a waste receptacle.

d. Rinse the sample bottle with system fluid. After purging the dead volume, fill it half-full with fluid collected from the sampling port. Cap the bottle and shake it for at least 1 minute. Drain the bottle into the waste receptacle.

CAUTION: Sampling ports and bottles that are inadequately cleaned will result in erroneous test results, which may cause the system to fail the test.

e. Without interrupting the fluid flow from the sampling port initiated in step d, fill the rinsed sample bottle to its appropriate level, remove it from the fluid stream, and cap the bottle. Do not completely fill the sampling bottle.

   – **Fluid Level for Flint Glass:** Approximately 1 inch (25 mm) below the shoulder

   – **Fluid Level for Plastic Bottle:** Approximately 1/4 inch (6 mm) below the shoulder

f. Terminate the fluid flow from the sampling port.

g. Turn off the power supply system's main engine.

h. Wipe the exterior of the capped bottle using isopropyl alcohol, or equivalent, and let dry.

i. Affix a tag to the filled sample bottle that identifies the following:

   – The date the sample was taken
   – Equipment nomenclature from which the sample was taken (*i.e.*, AIMD work center or squadron)—including unit identification code (UIC)
   – Point of contact (POC) and phone number

j. Analyze the hydraulic fluid drawn from the sample port for particulate contamination. Enter the results in Table 1.

k. Complete the data entries requested in Table 1 and as described in section 3.1.3.

5. Complete all remaining data entries requested in Table 1 and as described in section 3.1.3.

Procedures for Personnel Performing Particle Counter Testing

1. Calibrate the particle counter using the procedures set forth by the manufacturer and at the frequency recommended by the manufacturer.

2. Visually inspect the fluid sample. Fluid with visible particles or visible evidence of water should be rejected because visibly contaminated hydraulic fluid can clog and damage the sensor, leading to incorrect data on subsequent samples.

3. Shake the sample bottle vigorously for a minimum of 1 minute.

4. Measure the particle count following the manufacturer's instructions.

NOTE: The HYAC/ROYCO 8011 particle counter is sensitive to air bubbles. Follow the manufacturer's procedures for removing air bubbles to avoid erroneous particle counts.

5. Perform a particle count analysis on the sample fluid from the same sample bottle using patch test contamination kit P/N 57L414. Drain waste fluids into the appropriate receptacles.

6. Compare the results obtained from the particle counter and from the patch test analysis. If they do not agree, the patch test results shall take precedence.

7. Record all test data in Table 1.

8. Return the emptied sample bottle to the originator.

3.1.3 Instructions for Completing Table 1

- **Sample Number:** Indicate sample number.

- **Sample Date:** Indicate the dates the fluid sample was taken (month/day/year).

- **Work Center:** Indicate the center performing the task.

- **Equipment Nomenclature:** Describe the hydraulic supply from which the sample was drawn.

- **Particle Counter:** Indicate the NS class of the fluid particulate measured and whether it is NS class 5 or less ("pass") or greater than class 5 ("fail"). Indicate the presence/absence of water.

- **Patch Test:** Indicate the NS class of the fluid particulate measured and whether it is NS class 5 or less (“pass”) or greater than class 5 (“fail”). Indicate the presence/absence of water.

- **Test Date:** Record the date when the fluid particulate was measured using a particle counter and/or a patch test (month/day/year).

- **Point of Contact (POC):** List the POC and the technician responsible for measurement.

- **Qualitative Assessment:** Provide a brief narrative evaluation of the abilities of the particle counter and particle contamination monitor. Briefly discuss:

  - Efficiency of the method (*e.g.*, time and cost savings)
  - Ease of use and the unit’s ability to successfully interface with site operations
  - Overall satisfaction.

3.1.4 Supplemental Data

Supplemental data required for the evaluation includes the prevailing temperature and relative humidity measured at the station during the process. Both of these affect the time required for reducing the amount of dissolved water in the hydraulic fluid.

4.0 REPORTING

The data entry forms are a concise method of data collection. Forms should be completed on a daily basis. Data will be collected for 1 year. During this time, periodic status reports on the testing will be submitted to NAWCADLKE. The final report will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations.

Table 1

Sample Number	Sample Date	Work Center	Equipment Nomenclature	Particle Counter	Patch Test	Test Date	POC	Prevailing Temperature	Relative Humidity

Qualitative Assessment*:
Please comment on the effectiveness and efficiency of the unit.

____

____

____

____

*Attach extra sheet if required.

PREPRODUCTION INITIATIVE-NELP
PARTICLE COUNTER
FINAL REPORT

NS MAYPORT, FL AND NAS NORTH ISLAND, CA

1.0 INTRODUCTION

The U.S. Navy has adopted a proactive and progressive position toward protecting the environment and complying with environmental laws and regulations. Rather than merely controlling and treating hazardous waste by end-of-the-pipe measures, the Navy has instituted a program for Pollution Prevention (P2) to reduce or eliminate the volume and toxicity of waste, air emissions, and effluent discharges.

P2 allows the Navy to meet or exceed current and future regulatory mandates and to achieve Navy-established goals for reducing hazardous waste generation and toxic chemical usage. P2 measures are implemented in a manner that maintains Navy readiness. An additional benefit has been a general increase in operational efficiency.

The Navy has truly set the standard for the procurement and implementation of P2 equipment. The Chief of Naval Operations (CNO), Environmental Protection, Safety, and Occupational Health Division (N45), established the P2 Equipment Program, through which both the Naval Air Warfare Center Lakehurst (NAWCADLKE) and the Naval Facilities Engineering Service Center (NFESC) serve as procurement agents under the direction of (N45). P2 equipment is specified and procured under two complementary initiatives, the Preproduction Initiative (*i.e.,* technology demonstration) and the Competitive Procurement Initiative. The Preproduction Initiative directly supports both the Navy Environmental Leadership Program (NELP) for P2 shore applications and the P2 Afloat program, which prototypes and procures P2 equipment specific to the needs of ships.

This report provides an analysis of the procurement, installation, and operation of P2 equipment under the Preproduction Initiative. Technology demonstrations and evaluation were primarily performed under NELP at two designated NELP sites, NAS North Island and NS Mayport. Additional sites have been added as required to meet mission goals. The program involves defining requirements, performing site surveys, procuring and installing equipment, training operators, and collecting data during an operational test period. The equipment is assessed for environmental benefits, labor and costs savings, and ability to interface with site operations.

2.0 BACKGROUND

Maintenance of aircraft hydraulic fluid related to ground support equipment (GSE) is currently accomplished using the contamination analysis kit patch test method. This is the primary contamination measurement method used at all levels of maintenance within the fleet. However, on a day-to-day basis, this method is time-consuming and generates additional hydraulic fluid waste because of solvent contamination. In addition, interpretation of the fluid contamination data is subjective.

In view of Navy P2 goals, another method for measuring fluid particulate contamination in aircraft hydraulic fluid that does not require the use of solvents and is cost-effective is highly desirable. Electronic particle counters have the potential to achieve these goals. At least one of these types of devices has been authorized for depot-level maintenance as noted in the Aviation Hydraulics Manual (NAVAIR 01-1A-17, paragraph 2-26); however, its applications regarding P2 and Fleet Aircraft Intermediate Maintenance Departments (AIMDs) have not been substantiated.

Ten particle counter and particle contamination monitor systems were reviewed. Two of these, HIAC/ROYCO 8011 and Diagnetics Digital Contam-Alert (dCA), were selected for evaluation because they were considered to have the most potential to support the Navy aircraft hydraulic contamination control program and P2 goals. The hydraulic fluids of immediate and primary interest were MIL-H-46170 and MIL-H-83282.

Both systems are located at the AIMD activities at NAS North Island and NS Mayport. These activities provided the support and measurement data necessary to evaluate the effectiveness of the systems.

3.0 EQUIPMENT DESCRIPTION

The specifications, implementation requirements, and benefits of the HIAC/ROYCO 8011 and Diagnetics dCA systems are provided in the following paragraphs.

3.1 Specifications

The specifications of the HIAC/ROYCO 8011 and Diagnetics dCA systems follow.

3.1.1 HIAC/ROYCO 8011

The HIAC/ROYCO 8011 system is bench-mounted and is comprised of three units: the Model 8000A counter, an automatic bottle sampler (ABS-2), and a laser diode sensor (HRLD-400C). User-selectable printed data formats produced by the model 8000A counter are ISO, NAS1638, MIL-STD-1246A, USP<778>, and 209D. Technology used for the optical systems includes light-obscuring sensors/laser-illuminated diode and photo diode detector. Software can be downloaded to a standard computer, allowing further data evaluation. Utility requirements for system operation are 110 VAC at 60 Hz and pressurized air at 10 to 60 psi.

3.1.2 Diagnetics dCA

The Diagnetics dCA system is a portable device consisting of a fluid sensor interconnected with a hand-held portable condition monitor (PCM) (computer) with printer and a small portable pressure chamber. The PCM displays the fluid particle count measurement data from the dCA in a user-selectable format (*e.g.*, ISO, SAE, and NAS class), gravimetric equivalents, and particle counts greater than 5, 10, and 15 microns. The PCM data, with appropriate software, can be downloaded to a standard computer, allowing further data evaluation.

The technology used by the sensor is mesh obscuration. Utility requirements for system operation are 110 VAC at 60 Hz and pressurized air at 60 to 120 psi.

3.2 Implementation Requirements

The implementation requirements for the HIAC/ROYCO 8011 and Diagnetics dCA systems follow.

3.2.1 HIAC/ROYCO 8011

- Electrical: 115V, 60 Hz, 1 phase
- Pressurized air: 10 to 60 psi
- Size:
  - Model 8000A Counter: 12” wide x 16” deep x 6.5” high; 12 lb
  - ABS-2: 12’ wide x 18” deep x 27” high; 50 lb
  - HRLD-400C Laser Diode Sensor: 1.5” wide x 4” deep x 1.5” high; 1.1 lb

3.2.2 Diagnetics dCA

- Electrical: 115V, 60 Hz, 1 phase
- Pressurized Air: 60 to 120 psi
- Size:
  - PCM with Printer and Pressure Chamber: 4.5” wide x 2” deep x 1” high; <5 lb
  - dCA Sensor Probe Assembly: 2” diameter x 11” long; approximately 1.5 lb

3.3 Benefits

The benefits of the HIAC/ROYCO 8011 and Diagnetics dCA systems are as follows:

- Eliminate the need for solvent (P-D-680) dilution of hydraulic fluids.
- Reduce the volume of waste hydraulic fluid.
- Reclaim specimen fluid by combining with similar fluid for processing using a hydraulic purifier.
- Achieve objective particle counts as data printout.
- Reduce measurement process time.
- Provide user-selectable output data format

4.0 DATA ANALYSIS

Data was collected monthly from August 1995 through May 1996 at NS Mayport, and from June 1995 through January 1996 at NAS North Island in accordance with the Operational Test Plan. Each site activity received one HIAC/ROYCO 8011 and one Diagnetics dCA system. The data obtained is sufficient to support the conclusions and recommendations in this report.

The delivery, training, and warranty expiration dates for both systems are provided in Table 1.

TABLE 1. CHRONOLOGY

System	Delivery Date	Training Date	Warranty Expiration Date
NS Mayport			
✍ HIAC/ROYCO 8011	1 November 1994	14 December 1994/ 28 April 1995	1 November 1995
✍ Diagnetics dCA	28 November 1994	12-13 January 1995	1 December 1995
NAS North Island			
✍ HIAC/ROYCO 8011	4 November 1994	10 November 1994	1 November 1995
✍ Diagnetics dCA	28 November 1994	2 December 1994	1 December 1995

The Operational Test Plan describes the procedures to collect performance data for the systems. Initially, each activity compiled particle counter and corresponding patch test data for the fluid sample. This procedure continued until equipment operators became proficient in using the particle counter and particle contamination monitor systems, as was evident from a comparison of both data sets.

4.1 Quantitative Analysis

Test data obtained from the two activities are summarized in Table 2 and represent the number of particle count measurements made subsequent to authorization by the Naval Air Systems Command (NAVAIR) for use of the particle counter and particle contamination monitor system in lieu of the patch test at each AIMD. However, the patch test remains the primary contamination measurement method.

TABLE 2. TEST DATA

System	Site	Number Of Measurements	End Date
HIAC/ROYCO 8011	NS Mayport	306	May 1996
	NAS North Island	319	January 1996
Diagnetics dCA	NS Mayport	346	May 1996
	NAS North Island	217	January 1996

The system has a return on investment (per 10-year period) of $56,920.50, with the break even point occurring in 1.16 years.

The Cost Analysis incorporates the following assumptions:

- System cost is $7,500 (cost of UCC particle counter presently under competitive contract).
- Standard dry patch test takes approximately 1 hour to complete using an E-3 labor rate.
- Fifty-five particulate contamination measurements are taken per month.
- The NAS North Island and NS Mayport data apply.

4.2 Qualitative Analysis

Based on comments provided on the data sheets, the operational performance of each system is considered satisfactory for its intended use. It should be noted that these systems are applicable to fluids other than hydraulic oils as cited in each equipment manual.

4.2.1 Installation

Interfacing the particle counter systems to the site facilities was straightforward and without problems.

4.2.2 Training

Training was conducted on site by the manufacturers' representatives. The site activities reported that the training sessions were satisfactory. HIAC/ROYCO returned to NS Mayport a second time to enhance the original training session.

4.2.3 Maintainability

There were no major problems reported by the activities regarding the maintainability of the electronic particle counter systems. The HIAC/ROYCO 8011 at NS Mayport required some replacement parts at the start of the test period (See 4.2.5.1).

4.2.4 Interface With Site Operations

Both particle counter systems measure particulate contamination in aircraft hydraulic fluid and provide essentially the same environmental and cost benefits.

4.2.5 Overall Performance

The total number of measurements taken by these systems was too small to determine their reliability; however, periodic measurements were made using fluid of a known contamination to substantiate equipment calibration.

The usage data and service time were not sufficient to extract reliability data. NS Mayport, however, reported a minor difficulty with the HIAC/ROYCO 8011, which was subsequently rectified by the manufacturer.

4.2.5.1 HIAC/ROYCO 8011

The HIAC/ROYCO 8011 at NAS North Island had no problems. However, the HIAC/ROYCO 8011 at NS Mayport required the following items be replaced under warranty:

- ABS-2 pick-up tube replaced with a longer unit (August 1995).

- Desiccant chamber and in-line filter replaced (September 1995).

4.2.5.2 Diagnetics dCA

Neither activity reported any problems with the Diagnetics dCA.

5.0 LESSONS LEARNED

- Inventory of common spare parts (*e.g.*, in-line filters, desiccant chamber, and fuses) at the user level to preclude excessive downtime of the system.

- Do not store calibration kits in large quantities because these kits contain fluids with known particulates to simulate contamination and have a shelf life.

- Use calibration verification fluid only once. After the first use, the fluid certification regarding the remaining fluid is invalid because of potential contamination from particulates and moisture.

6.0 CONCLUSIONS

- The waste mixture of hydraulic oil and solvent P-D-680 resulting from the patch test process will be reduced by at least 50% in volume, and the waste will be comprised of hydraulic oil only.

- The volume of hydraulic oil waste resulting from particle counter measurements can potentially be eliminated if the maintenance activity uses a hydraulic oil purifier equivalent to the HII's Model HPU-1-5, which was also evaluated under NELP; however, the oil should not contain any contaminants prohibited by the appropriate purifier operations/maintenance manual.

- The cycle time required to conduct the particulate measurement process and obtain data is reduced from approximately 60 minutes required by the existing dry patch method to approximately 8.5 minutes when using a particle counter.

- Cost and environmental savings to Navy activities will be realized when devices of this type are adapted and used in lieu of the patch test for performing routine measurements at all maintenance levels.

The following actions are recommended:

- Use an electronic particle counter system to supplement the existing patch test at all Navy maintenance levels.

- Use the patch test as the primary method to determine hydraulic fluid particulate contamination.

PREPRODUCTION INITIATIVE-NELP
PORTABLE HIGH-PRESSURE BLAST UNIT
GENERAL DESCRIPTION

P2 Opportunity: Minimize waste, reduce labor, and provide a safer method for removing paint and marine growth from 70 foot launches.

Equipment Description: The system uses high-pressure water jet technology in an open blast environment to remove paint and marine growth from 70 foot launches. The system includes a portable berm to contain the wastewater and equipment to process the wastewater for reuse or disposal in the local sewer.

Implementation Requirements: TBD

Benefits:

- Reduce quantity and toxicity of wastestream.
- Reduce labor hours and cost for cleaning launches.
- Provide healthier work environment.
- Reduce hazardous waste disposal costs.

Other Information: TBD

Procuring Activity Manager: Jill MacIntyre, 1.1.X.7.1.J.B Tel: (908) 323-1936
Naval Air Warfare Center, Aircraft Division
Lakehurst, NJ

Technical Activity POC: Chris Mahendra, 4.8.2.5 Tel: (908) 323-7131

Vendor(s): TBD

FY/Site(s): 1997 NELP Initiative, NS Pearl Harbor

Cost: $100,000 estimate (1 unit)

PREPRODUCTION INITIATIVE-NELP
PORTABLE LEAD ANALYZER
GENERAL DESCRIPTION

P2 Opportunity: Distinguish between lead-based and non-lead-based coatings in DOD housing, administrative, and operations buildings, thereby minimizing laboratory testing of paint chips and promoting personnel awareness of lead hazards during paint removal operations.

Equipment Description: This hand-held, portable X-ray fluorescence (XRF) spectrum analyzer can determine the presence of lead in paint as well as soil. The unit has a sufficient depth index to penetrate multiple layers of paint and approximately quantify the amount of lead present. The unit is substrate-independent in the detection process.

Implementation Requirements:

- State license to operate equipment with radioactive CD-109 source
- Two-day training mandated for all personnel using the equipment

Benefits:

- Reduce the amount of laboratory testing required to analyze paint chips and soil samples, thereby saving time and costs.
- Provide a healthier environment because lead will be detected before workers are potentially exposed to hazards of lead paint or soil.

Other Information: IBM PC to run collection software and maintain records

Procuring Activity Manager: Jill MacIntyre, 1.1.X.7.1.J.B — Tel: (908) 323-1936
Naval Air Warfare Center, Aircraft Division
Lakehurst, NJ

Technical Activity POC: Mike Zitaglio, 4.8.1.6 — Tel: (908) 323-4284

Vendor(s): Niton Corporation — Model: Niton XL Spectrum Analyzer

FY/Site(s): 1995 NELP Initiative, NS Mayport

Cost: N/A

Note: This effort has been placed on hold until a technology that does not use a radioactive source is identified. For information on the findings of the XRF model, contact the Technical POC above.

PREPRODUCTION INITIATIVE-NELP
POWDER COATING TOUCH-UP SYSTEM
GENERAL DESCRIPTION

P2 Opportunity: Provide a kit for touching up powder coatings that allows the coating systems to be applied and removed with minimal effect on the environment. Encourage more widespread use of powder coating systems to eliminate VOCs from paint application processes.

Equipment Description: The powder coating touch-up system repairs minor scratches on mines in the field. The kit consists of hand-held equipment for substrate preparation, paint application, and paint curing. This is an alternative to repainting the entire mine and results in less paint being purchased, wasted, and disposed of. Paint touch-up saves time, labor, and transportation costs because the touch-up work can be performed on-site.

Implementation Requirements: TBD

Benefits:

- Improve corrosion protection.
- Simplify paint process.
- Minimize paint waste and dusts.
- Provide healthier work environment.
- Increase use of powder coating systems.

Other Information: Initially, the kit will be tested on mines but will be designed to accommodate other items (such as support equipment) that may be powder coated in the future.

Procuring Activity Manager: Jill MacIntyre, 1.1.X.7.1.J.B Tel: (908) 323-1936
Naval Air Warfare Center, Aircraft Division
Lakehurst, NJ

Technical Activity POC: Jim Ambrosino, 4.8.2.5 Tel: (908) 323-7904

Vendor(s): TBD

FY/Site(s): 1997 NELP Initiative, MOMAU 1, Seal Beach, CA

Cost: $25,000 estimate (1 kit)

PREPRODUCTION INITIATIVE-NELP PRESERVATION/DEHUMIDIFICATION SYSTEM GENERAL DESCRIPTION

P2 Opportunity: Use dehumidification technology as a substitute for corrosion preventive compound (CPC) use and reapplication in the protection of aircraft, aircraft components, armament, support equipment (SE), and armament weapons support equipment (AWSE). SE may be stored in a dehumidified storage system (DSS) indefinitely, thereby minimizing the time and hazardous waste generated during standard operational maintenance.

Equipment Description: Two 600 CFM dessicant wheel type dehumidifiers, Data Acquisition and Control System (DACS), and Portable Monitoring and Analysis System (PMAS), established in a permanent concrete structure measuring 120' long x 40' wide x 19.5' high.

Implementation Requirements:

- Standard electrical power
- Telephone lines for monitoring

Benefits:

- Eliminate significant quantity of hazardous materials.
- Reduce significant quantity of hazardous waste.
- Eliminate time required to perform corrosion control maintenance.
- Provide a healthier work environment.
- Ensure equipment is more readily available for deployment.

Other Information: None

Procuring Activity Manager: Jill MacIntyre, 1.1.X.7.1.J.B — Tel: (908) 323-1936
Naval Air Warfare Center, Aircraft Division
Lakehurst, NJ

Technical Activity POC: Robert Szuba, Code 4.3.4.6 — Tel: (619) 545-9754
Naval Aviation Depot North Island
San Diego, CA

Vendor(s): LOGIS-TECH, Inc.

FY/Site(s): 1995 NELP Initiative, NAS JRB Fort Worth, TX

Cost: $169,600 (1 system)

PREPRODUCTION INITIATIVE-NELP PRESERVATION/DEHUMIDIFICATION SYSTEM TEST PLAN

1.0 PURPOSE

To identify a dehumidification process that will minimize the generation of hazardous waste associated with aircraft/support equipment (SE) preservation maintenance.

2.0 OBJECTIVE

To quantify the reduction in hazardous material usage and hazardous waste generation and the affiliated cost savings associated with aircraft/SE preservation through the use of a Preservation/Dehumidification System (PDS).

3.0 BACKGROUND

The PDS uses dehumidification to protect aircraft armament, SE, and armament weapons support equipment (AWSE) from material degradation during periods of non-use. The system may also be used to protect aircraft and aircraft components. Dehumidification prevents macroscopic corrosion/degradation of aircraft/SE by minimizing the detrimental effects of environmental moisture. Items in dehumidified storage may be preserved indefinitely without the cyclic cleaning, preservation, and maintenance operations required by conventional preservation techniques. In effect, dehumidified storage reduces the use of hazardous protective and cleaning materials.

3.1 Preservation

The essence of aircraft and SE preservation is to protect critical exposed surfaces from the insidious destructive effects of the outside environment. Events such as rain, salt spray, corrosive chemical spills, direct sunlight, and high temperatures cause fairly rapid material deterioration and system breakdown if the system is inadequately protected during storage. Material degradation (in the form of corrosion or fungus) is the result of an electrochemical reaction fed by moisture and oxygen. Moisture is found in the air as humidity and can damage areas that are accessible to air. Water intrusion/condensation occurs routinely in areas that are hidden from casual inspection. As a result, significant pitting/crevice/intergranular corrosion and bacterial growth will occur if appropriate protective measures are not taken. Corrosion preventive compounds (CPCs) are currently used to displace the water and act as a surface barrier; however, CPCs only protect those areas on which it is applied and must be periodically renewed.

3.2 Dehumidification

Dehumidification (DH) is a process that removes moisture from the air. By extracting moisture from the air, the specific humidity and the relative humidity (R/H) is reduced to a level whereby the dew point temperature cannot be attained during the normal day-to-night thermal cycle. In a given storage area, daytime and nighttime air temperatures can vary as much as 40°F. This change in temperature affects the ability of the surrounding air to hold water. For example, at a daytime temperature of 70°F, the air can hold more than 100 grains of water per pound of air (specific humidity). However, at a lower nighttime temperature of 40°F, the air can only hold about 30 grains of water per pound of air. During the cooling transition from 70°F to 40°F, the excess moisture will condense onto nearby cool surfaces—such as aircraft skins and/or equipment structures. Depending on the humidity, the condensation and heavy dew might be obvious or may be microscopic (but no less destructive). Dehumidified air that is constantly circulated throughout a storage space will eventually extract moisture from inaccessible areas. Dynamic DH—the most effective means for dehumidifying large storage spaces—uses a dehumidifier to mechanically extract moisture from the air. When system equilibrium is achieved, the dynamic DH process stabilizes to a desired R/H range in which condensation will not take place with a drop in temperature.

R/H is expressed as a percent of saturation of water in air at a given temperature and pressure. Warm air holds more water than cold air. When air is completely saturated with water, it is at 100% humidity. If the air becomes warmer, more room for water is created. If the air becomes cooler, water is forced to leave the air and condense on surrounding surfaces. This condensation affects materials by conducting small electrical currents—activating corrosion of metals and giving life to bacteria and fungus. R/H below 50% dramatically slows the corrosion process. Conversely, R/H above 50% increases the corrosion process.

Certain materials can exist in a wide range of R/H without incurring damage, whereas other materials require a much narrower range. For instance, rubber and plastics can be safely stored in a R/H environment of up to 80%, but some metallic materials are best protected in a range of 35% to 40% R/H. Some polymeric materials will deteriorate under constant exposure to very low R/H levels (<25%), and still other materials are very sensitive to electrostatic discharge at low R/H levels. Aircraft, components and equipment are made of a variety of materials; therefore, the compromise range of 30% to 40% R/H has been chosen for the average day-to-night temperature change.

Through the use of dynamic DH, PDS cyclically extracts moisture from the air and recirculates it to the space requiring protection. PDS removes destructive levels of moisture from the storage environment—eliminating macroscopic material corrosion and degradation without the use of chemicals. DH protects assets during inactivity without the need for corrosion-inhibiting, water-displacing compounds required by conventional preservation methods. As a result, hazardous waste and associated disposal costs are reduced. In addition, DH significantly reduces the maintenance actions required to maintain an asset in active/RFI status.

4.0 PROJECT METHODOLOGY

The PDS will use a dehumidifier to dynamically dry the air of a shrouded covered storage space. The evaluation will be conducted for 1 year to evaluate the reduction and minimization of hazardous waste. The assets monitored will include (but are not limited to): SE, AWSE, aircraft armament, and aircraft components. The evaluation will be conducted in accordance with the project operation guidelines identified herein. **The evaluation will not hinder the availability of the assets being stored.**

5.0 RESPONSIBILITIES

- **Project Sponsor:** NAWCAD Lakehurst, Code 11X71JB, shall provide overall NELP policy and program management and funding in support of the project.

- **Project Manager:** LMTC-P NADEP NORIS, Code 4.3.4.6, shall:

  - be responsible for the overall integrity of the project, including equipment replacement/procurement
  - assist the equipment contractor with a site survey
  - identify the equipment required for the project and assist the Contracting Officer with equipment procurement
  - generate and maintain this project plan
  - generate a memorandum of agreement (MOA) among all activities participating in the project
  - provide engineering and management support during the initiation, operation, and conclusion of the project (to include site visits)
  - collect historical and project data
  - generate quarterly reports to be distributed to the Project Sponsor, Project Facilitator, and Contract Officer
  - generate a final report based on, but not limited to, historical data, monthly reports, and personnel interviews
  - act as a point of contact (POC) for technical assistance.

- **Contracting Officer:** NAVAIRSYSCOM, AIR 2.5.2.4.1, shall procure equipment and services required in support of the project.

- **Project Facilitator:** COMNAVAIRESFOR, Code N4213, shall approve site selection, identify a Site Coordinator, and provide final disposition of equipment at the end of the program.

- **Site Coordinator:** AIMD, NAS JRB Fort Worth, shall assist the equipment contractor with a site survey; maintain the integrity of the system; schedule and perform preventive maintenance as identified in this plan; and generate reports for distribution to the Project Manager.

- **Equipment Contractor** shall:

  – assist project managers and facilitators with a site survey
  – procure, install, integrate, test, and burn-in the system in accordance with the Statement of Work and in the presence of the LMTC-P representative
  – provide on-site training on the operation, servicing, maintenance, troubleshooting, and repair of the PDS and associated equipment
  – provide the LMTC-P with all related operating and maintenance manuals
  – provide warranties on all equipment associated with the PDS (warranties must be 2 years on parts and labor).

6.0 SYSTEM DESCRIPTION

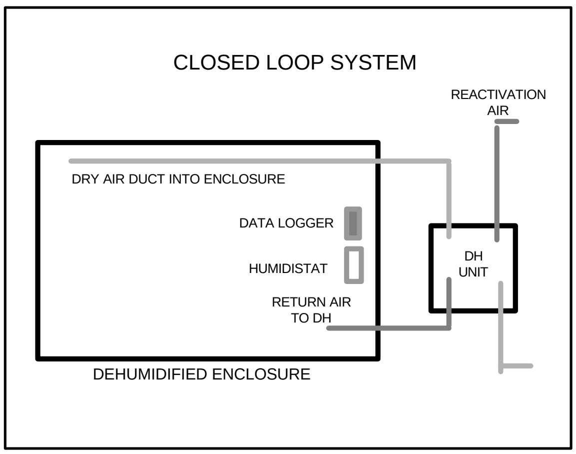

Figure 1. Closed Loop System

The PDS will be set-up within Bunker 4252 at NAS Fort Worth, Texas. The space is no larger than 4,480 ft^2, is a permanent concrete structure, and measures 150' long x 50' wide x 25' high. The building has double rolling doors on each end, lighting on the inside, and electrical power. Phone lines will be provided as government-furnished equipment. The building is in a fenced area controlled by a security force. The system will be a "turnkey system" comprised of an interior hangar/building drop shroud, dehumidifier, automated/computer-controlled monitoring system (DACS) with remote control capabilities via modem. The shroud will be installed inside the bunker using existing eyebolts attached to interior walls. The shroud will contain roof and side curtains. The dehumidifier will maintain the shrouded environment between 30% to 40 % R/H. The dry air will be recirculated from the dehumidifier to the shrouded space in a closed loop by ducting placed in accordance with the guidelines herein. The DACS monitor and sensor system will be set-up inside the dehumidified shroud per the set-up guidelines identified herein. The system will monitor and record temperature, humidity, dew point, vapors (LEL), and equipment operating time for data collection. The system will provide reports on all recorded measurements at selected intervals.

7.0 EQUIPMENT

- **Two 600 CFM desiccant wheel type dehumidifiers** with:

  – Weatherproof D/H housing
  – Reactivation and process blowers
  – Process and reactivation cleanable roughing filters
  – Reactivating heaters sized for 220V/3ph/60 Hz electrical utility with energy modulation features

- Fully automatic and manual operation
- 10% LEL vapor sensors and vapor sensor control
- Reactivation inlet and outlet weather hoods
- Process inlet transition
- Disposable 30% air filter and frame
- 10% air filter and frame
- Skid with casters
- Knife switch disconnect
- 50 foot power cable.

• **Shroud system** made of translucent, lightweight, strong material with the following features:

- Non-rigid corners, walls, and ceilings, suspended or supported
- Translucent
- Flame-resistant material in accordance with National Fire Protection Agency and Underwriter Laboratory fire/flame resistant requirements (NFPA 701)
- Material with the vapor transmission rate of 0.08 g/100 in^2 in 24 hours.

• **Data Acquisition and Control System (DACS)** with the following features:

- Monitoring system sensors to collect, display, and record R/H, temperature, and dew point of ambient and controlled environments, LEL, equipment operating time, faults, and fault causes
- Ability to control the running cycle of at least two dehumidifiers
- Modem communication
- Two computer monitoring stations located within the dehumidified space and at designated POC site
- Ability to run automatically without user interface
- Ability to record monitored sensor data and store with backup for a period of no less than 1 year
- Ability to report, via charts and graphs, all recorded measurements at selectable intervals
- Visual and audio alarm system identifying DH shutdown by LEL sensor.

• **Portable Monitoring and Analysis System (PMAS)** to facilitate field measurements of R/H and temperature over extended periods of time and to assess DACS remotely. The PMAS shall have the following features:

- Battery-powered
- Intel Pentium-based processor
- Active Matrix, 10.4", 65K color liquid crystal display
- PCMCIA type III card slot
- Infrared port
- User-replaceable 772 MB hard drive

- Modem communication capability
- Dual lithium ion batteries
- Software required to retrieve, store, graph, and report the sensor data logger information
- Battery-powered sensors and optical data transfer
- Maximum of 16,000 data point collection
- Programmable sample rate: 2 seconds to 2 hours between samples
- Three R/H and temperature data loggers with a sensor range of 0% to 100% at an accuracy of +/-2% at 25°C and -40°F to +158°F at an accuracy of +/-0.8°F.

- **Air distribution system** will transport air via ducting from the dehumidifier to the shroud interior, move it throughout the shroud interior, and return the shroud air to dehumidifier.

- **The following ancillary equipment** shall be included:

  - Calibration kits for all system sensors
  - Manufacturer kits of recommended spares to maintain dehumidifiers, DACS, and PMAS for 3 years
  - One additional sensor of each type
  - Repair kit for shroud system
  - Two hygrothermographs; wind-up type with weekly drum chart
  - Spare hygrothermograph drum charts sufficient for 2 years of operation.

8.0 PLAN OF ACTION AND MILESTONES (POA&M)

The project will be performed in the following phases (identified in chronological order). A “T” indicates that travel will be required.

- **Pre-Startup: 5.5 months**

  - *Site Survey*: 32 hours (T) *Timeline*: 2 days
    The survey shall take approximately 2 days and shall consist of a thorough evaluation of the site facilities, personnel, and operations. The information gathered from the site surveys will be compiled in a material listing (generated by the equipment contractor), which will be used to develop the project plan. The site survey will require the LMTC-P representatives to travel to the evaluation site.

  - *Identify and procure required equipment*: 80 hours *Timeline*: 2.5 months
    Based on the site survey material listing and preliminary research, the Project Manager will identify all equipment required for successful implementation of the project. In addition, the Project Manager will help the Contract Officer procure the equipment. The identified timeline includes a 2 month manufacturer lead-time.

  - *Project plan development*: 160 hours *Timeline*: 2.5 months

The project plan will be prepared by the program managing activity and will be the primary operations document. It will include the following elements: Purpose, Objective, Background, Project, Responsibilities, Data Collecting Procedures, POA&Ms, Project Set-Up, Project Equipment, and Operating and Maintenance Procedures. In addition to this project plan, a memorandum of agreement will be established among all participating activities to ensure compliance with the established plan and to ensure the success of the project.

- *Collection of historical information*: 80 hours (T) *Timeline*: 3 weeks
  Historical performance and maintenance information shall be collected on the items stored during the evaluation. This information will establish a performance baseline and will be used as comparison data for the final project analysis.

- **Start-Up Requirements: 2.5 months**

  - *Site Preparation*: 40 hours (T) *Timeline*: 1 month
    During site preparation, required site upgrades or improvements identified and reported by the equipment contractor will be made by the contractor and/or Project Facilitator prior to equipment installation. One representative from the LMTC-P will oversee/assist the contractor and travel to the site to confirm that the site is acceptable for equipment installation in accordance with this project plan.

  - *Equipment Setup*: 40 hours (T) *Timeline*: 1 month
    The equipment will be installed at the project site by representatives of the equipment contractor, the Project Facilitator, and the Project Manager.

  - *Burn-in*: 40 hours (T) *Timeline*: 10 days
    During the burn-in, the operation of the equipment will be evaluated, and appropriate procedure and/or equipment configuration changes will be made by the equipment contractor per the SOW or the Project Facilitator. The Project Manager will assist as necessary. One representative from the LMTC-P will oversee and witness the start of system and oversee the entire burn-in phase.

Note: The dehumidifier connections shall be as airtight as possible. The unit shall be turned on and allowed to run continuously for the initial drawdown of the R/H. The general enclosure R/H shall be periodically monitored. This should identify system airflow leaks or enclosure seal problems, which should be immediately corrected. Access into the dehumidified space should be limited until the R/H has stabilized.

– *Training:* 40 hour (T) *Timeline*: 1 week
All pertinent representatives from the Project Facilitator commands and the Program Manager shall be trained on the operation, maintenance, and repair of the equipment prior to project initiation. The 1 week training classes shall be arranged by the equipment contractor and shall include classroom and practical instruction.

– *Equipment turn-over and project activation*
The Project Manager will accept all equipment from the equipment contractor and initiate the test when a successful equipment burn-in has been accomplished. The inspection intervals and data collection should begin once the R/H is stabilized (between 30% and 40%) and the system appears to be functioning properly.

– *Item Induction*
SE shall be prepared and maintained for DH per the Type III, short-term preservation requirements of NAVAIR 17-1-125. In addition, all fluids (except hydraulic) must be changed. Hydraulic fluid must be checked for contaminants and moisture content. If moisture is present, hydraulic fluid must be changed. Installation of barrier material or covers is not required. When SE is removed from dehumidified storage, each item must undergo a one time inspection (per NAVAIR 17-1-125 and/or the applicable MRCs) to include those inspections not accomplished when preserved. Ensure that a Form 1 is initiated and completed upon performing induction, any maintenance, and/or withdrawal actions per the recordkeeping instructions in this plan.

Note: At present, only SE will be placed in dehumidified storage. All other items require the approval of the Project Facilitator.

- **Operation: 1 year**

– *Maintenance services for system equipment*: 40 hours
Preventive maintenance and minor repairs shall be performed by the Site Coordinator. The Project Manager will be responsible for providing technical assistance as needed. Log all maintenance/repair actions on a 4790/51 form for all equipment supporting the storage. PDS maintenance shall include the following inspections.

Daily Inspection

a. Check enclosure for obvious compromises (*e.g.,* tears, moisture intrusion).
b. Check security and general condition of the site (*e.g.,* look for open doors and windows, clutter, and obvious safety hazards).
c. Check hygrothermograph for proper operation (*e.g.,* recording pens are working and the traces are legible).
d. Check dehumidifier for obvious malfunctions (*e.g.,* check no fault light, unit "on" setting, setting of humidistat, and pressure differential) and adjust as necessary.

e. Make entry into site logbook; note dehumidifier run time.

7 Day Inspection

a. Perform daily inspection.
b. Change the hygrothermograph paper roll(s) or disc(s) and print out humidity, dew point, and temperature data for the week in graph form.
c. Make additional entry into site logbook; note reactivation air temperature.

Note: When changing the chart on the hygrothermograph, ensure that the spring is wound properly, that the start date is documented on the new chart, and that the horizontal time scale matches the day and time of the inspection. Ensure the following information is on the removed hygrothermograph paper roll/disc: start date (initialed), stop date (initialed), hygrothermograph part number, and location (building and position) of the hygrothermograph.

28 Day Inspection

a. Perform daily and 7 day inspections.
b. Inspect the dehumidifier unit as follows:

   1. Inspect the desiccant wheel for contamination and deterioration due to plugged channels.

Note: The wheel should last many years if the filters are kept clean and contaminants are not allowed to reach the desiccant channels.

   2. Check and clean filters; replace with new filter(s) as necessary.
   3. Lubricate bearings, if applicable, and clean seals.
   4. Inspect for cracks and deterioration in drive belts, replace if faulty.
   5. Inspect heater elements for breaks; replace or repair if necessary.

c. Visually inspect the ducting for obvious cracks and mechanical damage. Replace if not fit for use.
d. Compile the R/H data and print out R/H, dew point, and temperature data for the month in graph form.
e. Generate a monthly report per this project plan.

56 Day Inspection

a. Perform daily, 7 day, and 28 day inspections.
b. Inspect humidistat and compare against hygrothermograph readings.
c. Inspect the humidistat sensor unit for an accumulation of dust and dirt. If necessary, clean with a soft bristle brush and wiping cloth. For a more thorough cleaning, refer to the manufacturer's manual.

180 Day Inspection

a. Perform daily, 7 day, 28 day, and 56 day inspections.
b. Randomly inspect 10% of stored items for corrosion, dirt, degradation, etc. Correct per applicable technical publication. Log all actions on an OPNAV FORM 4790/51 and Form 1 for each item.

Calibration

Calibrate data recorders, hygrothermographs, vapor sensors, and temperature controllers on dehumidifiers per manufacturer's specifications. If this information is unavailable, calibrate all equipment supporting the storage site **annually**. The gas vapor sensor shall be calibrated every **6 months**.

Corrective Actions

a. ***Enclosure Compromise***. Per manufacturer's recommendations, fix/mend enclosure compromise within **24 hours** of recognizing the incident. The use of plastic sheeting, preservation tape, caulking, and liquid foam may be used to properly seal the enclosure. Document all corrective actions in site logbook.
b. ***DACS Malfunction***. Notify Project Manager for corrective action and document in site logbook.
c. ***Hygrothermograph Malfunction***. Adhere to the following procedures.

    1. If the chart paper binds up, correct it. If it occurs a second time, replace the hygrothermograph.
    2. If paper is changed prematurely (midweek), place the used paper in a plastic bag and attach it to the indicator for the next data collection operation.
    3. Replace the paper roll/disc to coincide with **7 day** maintenance interval. Document corrective action in site logbook.

d. ***High/Low Humidity Indications*** (outside the 30% to 40% humidity range)

    If < 30%
    1. Correct within **24 hours** of acknowledging the low R/H. Document corrective action in site logbook and notify Project Manager.
    2. Compare hygrothermograph or data logger data with DACS. If found faulty, replace hygrothermograph or data logger.
    3. Check humidistat controls/sensors. If malfunctioning, correct per manufacturer's manual. If operating properly, proceed to step 4.
    4. If local weather conditions identify low R/H occurrences, check for leaks in the enclosure. If local weather conditions do not identify a low R/H condition, shut down system and check the dehumidifier controls; refer to DH troubleshooting guide.

If >40%

1. Correct within **16 hours** of acknowledging the high R/H. Document corrective action in site logbook and notify Project Manager.
2. Compare hygrothermograph or data logger data with DACS. If found faulty, replace hygrothermograph or data logger.
3. Check humidistat controls/sensors. If malfunctioning, correct per manufacturer's manual. If operating properly, proceed to step 4.
4. If local weather conditions identify high R/H occurrences, check for leaks in the enclosure and ducting; reseal if found. If no apparent leaks are found or if the condition persists after sealing, inspect the DH unit per manufacturer's troubleshooting guide.
5. If the protected space is exposed to humidity levels exceeding 50% for longer than **48 hours**, the items to be dehumidified must be thoroughly inspected for corrosion.

e. ***Power Failure.*** If the system(s) is shut down due to a site power failure and this compromises the effectiveness of the system, a generator shall be activated to support the test. The generator shall support the storage site until the cause of the power failure is rectified.

– *Monitoring services*: 192 hours (T)
One LMTC-P representative shall visit the project site a minimum of once every 2 months to collect preliminary data and to evaluate project progress.

– *Recordkeeping*
Data pertaining to item induction, maintenance, withdrawal man hours, material cost, and waste generation/disposal will be collected and analyzed in addition to the temperature, dewpoint, and R/H information. For data verification, the site must be equipped with a hygrothermograph or data logger.

Stored Items. Retain inventory of stored items. Tag each item stored with an identifying date and level of preservation. On a 4790/51 form, all pre- and post-preservation procedures must be documented.

Storage Site. A logbook shall be kept to document the following information:

a. Date and time of inspection or any enclosure compromise
b. Inspections performed or description of enclosure compromise
c. Site maintenance actions performed
d. Corrective actions on PDS equipment
e. Dehumidifier run time
f. Reactivation air temperature (120°F minimum), from dehumidifier thermostat
g. R/H reading(s) from hygrothermograph(s)
h. Name of person who performed the inspection or entered enclosure.

The information in the logbook can help establish a preventive maintenance cycle for the equipment at each site. Maintain a file of the hygrothermograph papers and logbooks.

Form 1. Initiate and maintain a Form 1 for one item of each type of SE, armament, or AWSE stored at the project site.

Reports

a. ***Weekly Reports:*** A weekly report should be produced and maintained with or in the logbook. The report should identify the hours during which the enclosure experienced the following humidity levels and include a graph of the daily average humidity level.

   1. Above 40%: ______ hours
   2. 30% - 40%: ______ hours
   3. Under 30%: ______ hours

b. ***Monthly Reports:*** Each month, the Site Coordinator shall generate a monthly report that summarizes the status of the project site using information documented in the site logbook, Form 1(s), hygrothermograph temperature/humidity readings, and any other information unattainable via the PMAS. The report shall be submitted to the Project Manager and copied to the Project Facilitator.

c. ***Progress Reports:*** Every 3 months, the Project Manager shall analyze and organize the information from monthly reports and data accessed by the PMAS into a progress report for the Project Sponsor.

- **Shut-down/Project Completion: 4 months**

  – *Disestablish sites*: 40 hours (T) *Timeline*: 1 week
  On completion of the project, one LMTC-P representative shall travel to the project site (not to exceed 1 week) to interview project sponsor personnel and assess condition of equipment.

- *PDS equipment disposition*: 40 hours + material *Timeline*: 1 month
  As required, the Project Manager shall arrange to transfer custody of, package, and ship the equipment from the project site to a location identified by the Project Facilitator.

- *Final report* *Timeline*: 3 months
  The Project Manager will generate a final report that summarizes the project process, successes, problems, and data analysis and establishes the reduction in hazardous waste generation and disposal costs.

FORM 1. PRESERVATION MATERIAL/MAN HOUR EXPENDITURE RECORD

ACTIVITY/STATION:	NOMENCLATURE:
LOCATION:	PART NO:.
TEC:	S/N:
[1]PUBLICATION:	
CHECK ONE: o GSE o AWSE o AC o AC COMP	
PRESERVATION ACTION: o INDUCTION o MAINTENANCE o MAINTENANCE WASH o WITHDRAWAL	

[2]PRES LEVEL	[1]MHRS REQUIRED	MHRS EXPENDED 1 YR (A)	QTY IN PRES (B)	TOTAL MHRS EXPENDED (A X B)
1				
2				
3				

[2]PRES LEVEL	[2]MATERIAL ITEM #	MATERIAL AMOUNT (LBS)	WASTE AMOUNT (LBS)
1			
2			
3			

NOTES: 1. REFER TO MRCS. OR NAVAIR 17-1-125
2. PER NAVAIR 17-1-125 OR NAVAIR 15-01-500.

COMMENTS:

PREPRODUCTION INITIATIVE-NELP
RADAR LIQUID COOLANT RECYCLING SYSTEM
GENERAL DESCRIPTION

P2 Opportunity:	Reduce the quantity of avionic dielectric coolant that must be disposed of as hazardous waste.
Equipment Description:	The avionic dielectric coolant servicing cart treats and recycles dirty poly alpha olefin (PAO)—the liquid coolant used in the aircraft radar and missile liquid cooling loop. The cart removes particulate matter and other contaminants, thereby controlling liquid pumping characteristics.
Implementation Requirements:	TBD
Benefits:	Reduce quantity and cost of fluid disposal. Reduce requirement for procurement of new fluid.
Other Information:	TBD
Procuring Activity Manager:	Jill MacIntyre, 1.1.X.7.1.J.B — Tel: (908) 323-1936 Naval Air Warfare Center, Aircraft Division Lakehurst, NJ
Technical Activity POC:	Joe Cruz, 4.8.2.5 — Tel: (908) 323-2966 Son Nguyen, 484900E — Tel: (805) 989-0014
Vendor(s):	TBD
FY/Site(s):	1997 NELP Initiative, NAS North Island
Cost:	$20,000 (estimate for 1 unit)

PREPRODUCTION INITIATIVE-NELP
SHREDDER/CHIPPER UNIT
GENERAL DESCRIPTION

P2 Opportunity: Reduce the volume of organic solid waste. Waste may be used on site as mulch fertilizer, thereby eliminating collection and disposal costs.

Equipment Description: This unit is used to mulch organic waste (*e.g.*, tree limbs, branches, etc.). The 16-hp gas-powered shredder/chipper unit with a 5" diameter chipping capability has a variety of screens to handle wet or soggy organic matter.

Implementation Requirements:

- Electric start with key
- Gas-powered Kohler Magnum solid cast iron engine

Benefits:

- Reduce organic waste volume.
- Save costs due to reuse of mulch waste as fertilizer.

Other Information: None

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Technical Activity POC: Mike Zitaglio, 4.8.1.6 Tel: (908) 323-4284

Vendor(s): MacKissic, Inc. (Manufacturer)
California Turf (Distributor) Model: SC182-16

FY/Site(s): 1994 NELP Initiative, NAS North Island

Cost: $3,971 (1 unit)

PREPRODUCTION INITIATIVE-NELP
SODIUM BICARBONATE BLASTING SYSTEM (4' X 4')
GENERAL DESCRIPTION

P2 Opportunity: Use biodegradable sodium bicarbonate blast media to remove paint from aircraft parts as a replacement for methylene chloride chemical stripper.

Equipment Description: The equipment is a self-contained blasting glovebox unit designed to handle coarse to fine particle blasting media (30 to 400 mesh). A sidetrack and turntable with a 1,000-lb. capacity are included to facilitate parts handling.

Implementation Requirements:

- Electrical: 110V, 1 phase, 60 Hz; 220/440V, 3 phase, 60 Hz
- Air supply: 100 CFM at 120 psi
- Size: 95" high x 66" deep x 96" wide, including sidetrack and turntable

Benefits: Benefits of sodium bicarbonate blast media will be measured when approval to blast airborne parts with sodium bicarbonate is obtained.

Other Information: Equipment is capable of being used for plastic media blasting (PMB).

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Technical Activity POC: Gabrielle Korosec, 4.8.1.4 — Tel: (908) 323-7130

Vendor(s): ICM Inc. — Model: Super Hone 4800, Style III

FY/Site(s): 1994 NELP Initiative, NAS North Island

Cost: $7,836 (1 unit)

PREPRODUCTION INITIATIVE-NELP
SODIUM BICARBONATE BLASTING SYSTEM (4' X 4')
COST ANALYSIS

PROTOTYPE SITE: NAS North Island

DESCRIPTION: Self-contained blasting glove box system designed to handle coarse to fine particle blasting media, from size 30 to 400 mesh. The system was selected for use with sodium bicarbonate blasting media to replace the methylene chloride chemical stripper previously used to remove paint from small aluminum and magnesium aircraft parts.

DATA COLLECTION PERIOD: No data has been collected on blasting with sodium bicarbonate media because of the extensive certification testing requirement for process approval. The system is currently being used with plastic media for small parts blasting. Environmentally safe solvents that can replace methylene chloride are under review.

COST SAVINGS: No data analysis will be performed for this unit.

PREPRODUCTION INITIATIVE-NELP
SODIUM BICARBONATE BLASTING SYSTEM (4' x 4')
FINAL REPORT

NAS NORTH ISLAND, CA

The 4' X 4' sodium bicarbonate blasting system was purchased through the Navy Environmental Leadership Program (NELP) and was intended to be a preproduction purchase to test the feasibility of using sodium bicarbonate as a blasting medium for cleaning and surface coating removal of aircraft components, including aircraft wheels. However, approval for use on aircraft would not be granted without excessive testing to indicate side effects of sodium bicarbonate on the substrate. Tests required included blasting effects on substrate cracks and fatigue life quantification. Because of the anticipated costs associated with these tests—as well as the timeframe required to perform these tests and gather the required information—the system is not being used on aircraft components. The system is being used to clean various pieces of support equipment using plastic blast media.

Because the intended purpose of using sodium bicarbonate was not achieved, no test data are available, and there is no projected date for a change in policy regarding cleaning of aircraft components with sodium bicarbonate, this NELP initiative is considered closed.

PREPRODUCTION INITIATIVE-NELP
SODIUM BICARBONATE BLASTING SYSTEM (WALK-IN)
GENERAL DESCRIPTION

P2 Opportunity: Use unblended and blended sodium bicarbonate blast media to remove paint and corrosion from ground support equipment. Reduce wastestream costs by replacing harsh grit blast media with biodegradable sodium bicarbonate media.

Equipment Description: The equipment is a self-contained, weather-proof blasting system comprised of a pass-through blasting unit, a trailer-mounted control booth, and air systems. Pass-through doors at each end provide 11' x 15' openings.

Implementation Requirements:

- Electrical: 440V, 60 Hz, 3 phase
- Air supply: 400 CFM at 100 psi
- Size: Blast unit approximately 33' long x 18.5' wide x 12' high; trailer/control booth and air systems approximately 8' long x 40' wide x 20' high

Benefits:

- Easy processing of large SE components.
- Facilitate component handling through pass-through doors.
- Reduce wastestream volume.
- Provide cost-effective means of separating hazardous/solid material from blast media recovered from process.
- Preclude component contamination because media are used only once.
- Use blended media to minimize the amount of harsh media used.

Other Information: The control booth houses two interconnected blast pots with provisions for selecting media from either or both pots simultaneously. This provides the flexibility for media blending.

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Technical Activity POC: Gabrielle Korosec, 4.8.1.4 — Tel: (908) 323-7130

Vendor(s): Smith Industrial Supply — Model: N/A

FY/Site(s): 1994 NELP Initiative, NAS North Island

Cost: $247,890 (1 system)

PREPRODUCTION INITIATIVE-NELP
SODIUM BICARBONATE BLASTING SYSTEM (WALK-IN)
COST ANALYSIS

PROTOTYPE SITE: NAS North Island

DESCRIPTION: The equipment is a walk-in modularized blasting system designed for use with sodium bicarbonate blasting media and sized to handle large structures (*e.g.,* mobile facilities, crash cranes, and aircraft slings). The use of sodium bicarbonate as blasting media can significantly reduce the wastestream. The sodium bicarbonate, which constitutes a large percentage of the waste volume, dissolves into solution, allowing the paint and corrosion product particulates removed during the blasting process to be filtered from the solution. Disposal of the particulates is contingent on its waste classification (*e.g.,* lead paint). Currently, the solution is suitable for disposal in the public sewer system.

DATA COLLECTION PERIOD: Data collection was initiated in December 1995.

COST SAVINGS: The system reduces the volume of blast media that must be disposed of as hazardous waste. The labor, consumables, and waste disposal costs were recorded for the removal of coatings using sodium bicarbonate from various pieces of SE. An estimate is given for corresponding data as if each piece of SE had been stripped using garnet. The SE components include: two E-2 Slings, Forklift 4K, Steel Enclosures, C-2 Sling, Universal Engine Sling, and Radiator Grill Shell.

PREVIOUS METHOD: Blast System Using Garnet Blast Media

Consumables

Estimated pounds of garnet required to perform work on SE components listed above: 600
Cost per pound of garnet: $0.08
Total cost: $48.00

Labor

E-3 labor rate per hour: $10.39
Estimated time to perform cleaning on SE components listed above: 8 hours
(Note: Estimate is based on the assumption that it takes approximately 40% of the time required to perform the cleaning via the NELP method.)
Cost per month: $83.12

Waste Disposal

Pounds of blast media to be disposed of: 600
Disposal cost per pound: $0.10
Total cost: $60.00

Total Annual Costs

Item	Cost
Consumables	TBD
Labor	TBD
Waste Disposal	TBD
Total	TBD

NELP METHOD: Blast System Using Sodium Bicarbonate Blast Media

Consumables

Pounds of blast media (Profile XL) used to clean SE components listed above: 1,230 **Cost per pound:** $0.56
Total cost: $688.80

Labor

E-3 labor rate per hour: $10.39
Time to perform cleaning on SE components listed above: 19 hours
Total cost: $197.41

Waste Disposal

Hazardous media filtered from solution: N/A
Filters, hazardous media: N/A
Pounds of spent sodium bicarbonate media, non-hazardous: N/A
Pounds of spent sodium bicarbonate media, hazardous: 1,230
Disposal cost per pound: $.10 (same as spent garnet)
Total cost: $123.00

Total Annual Costs

Item	Cost
Consumables	TBD
Labor	TBD
Waste Disposal	TBD
Total	TBD

COST SUMMARY ANALYSIS (PER YEAR)

System Using Garnet (to date)	$191.12
System Using Sodium Bicarbonate Blasting (to date)	$1,009.29
Cost Change	TBD
Initial Procurement	247,890.00
Expected Service Life	10 years
Return on Investment (per 10-year period)	TBD
Break Even	TBD

PREPRODUCTION INITIATIVE-NELP
SUPER FLIGHT LINE ELECTRICAL DISTRIBUTION SYSTEM
GENERAL DESCRIPTION

P2 Opportunity: Reduce emissions created by diesel engine-driven support equipment (SE) by replacing the existing engine-driven power supplies with host facility power and redistributing the conditioned power along the flight line. Reduce hazardous waste due to maintenance on flight line SE by reducing the quantity of required equipment to service aircraft.

Equipment Description: The Super Flight Line Electrical Distribution System (SFLEDS) converts and conditions 480V, 60 Hz host facility grid power to 120V, 60 Hz output for low voltage equipment and 115V, 400 Hz output for aircraft while still allowing outputs of 480V, 60 Hz for heavy-duty equipment.

Implementation Requirements:

- Routing of the 480V, 60 Hz power cable from the host facility grid to the SFLEDS site
- Electric: 480V, 60 Hz input power and power cable connection at the input of the SFLEDS unit

Benefits:

- Eliminate hydrocarbon and carbon monoxide emissions.
- Reduce hazardous and flammable materials on the flight line.
- Reduce hazardous waste due to maintenance of SE.

Other Information: None

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Technical Activity POC: Jerry Parker, 4.8.2.1 Tel: (908) 323-7419

Vendor(s): Frequency Converters: Unitron, Inc.
Transformers: Hevi Duty
Controls: Square D
Power Cable: General Cable
Connectors: Burton
Step-Down Transformer: Ajax

FY/Site(s): 1995 NELP Initiative, NAS North Island

Cost: TBD

PREPRODUCTION INITIATIVE-NELP
T56 CADMIUM TREATMENT SYSTEM
GENERAL DESCRIPTION

P2 Opportunity: Minimize the toxicity and volume of effluent wastewater from T56 engine wash down procedures by treating the wastewater to remove cadmium and other contaminants, as identified.

Equipment Description: Three different technologies have been proposed for treating engine wash effluent. Each involves oil/water separation followed by adsorption of emulsified oils and chemical precipitation of heavy metals or ion exchange for removal of heavy metals.

Implementation Requirements: TBD

Benefits:

Reduce toxicity of wastestream.
Reduce volume of wastestream.
Provide healthier work environment.

Other Information: TBD

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Technical Activity POC: Chris Mahendra, 4.8.2.5 Tel: (908) 323-7131

Vendor(s): TBD

FY/Site(s): 1997 NELP Initiative; NAS Jacksonville, NAS Brunswick, NAS Willow Grove

Cost: $130,000 (estimate for 3 units)

PREPRODUCTION INITIATIVE-NELP
VACUUM SANDING SYSTEM
GENERAL DESCRIPTION

P2 Opportunity: Use portable vacuum sanders to remove coatings from composite structures while capturing solid waste. Eliminate airborne particulate matter and potential lead dust exposure hazard.

Equipment Description: The system includes one vacuum cleaner, two vacuum assist sanders, two vacuum assist grinders, and one tool caddy.

Implementation Requirements:
Electrical: 115/220 VAC, 60 Hz (vacuum cleaner)
Size: 31" long x 21" wide x 19" high
Compressed Air: 85 psi

Benefits:

- Reduce pollution from current power sanding operations.
- Improve efficiency of operations.
- Improve personnel safety by collecting and containing paint dust particles.
- Reduce labor hours for manual sanding operations.

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Technical Activity POC: Chris Mahendra, 4.8.2.5 — Tel: 908-323-7131

Vendor(s): Clayton Associates, Inc. — Model: 660-DM-1000

FY/Site(s): 1995 NELP Initiative, NS Mayport

Cost: $20,639 (4 units)

PREPRODUCTION INITIATIVE-NELP
VACUUM SANDING SYSTEM
COST ANALYSIS

PROTOTYPE SITE: NS Mayport

DESCRIPTION: An air-powered, portable, lightweight abrasion system that is operable by one person. Includes a high-efficiency particulate (HEPA) air filter vacuum unit to capture sanding residue, thereby allowing the operator to work without a respirator when processing lead-based and polyurethane painted surfaces.

DATA COLLECTION PERIOD: To be determined

COST SAVINGS: Processing radomes and equivalent composite structures using the vacuum sanding system has shown some decrease in process time for a radome assembly. However, the largest benefit is personnel safety. The vacuum and filtration process eliminate airborne toxins (including lead, chromium, and dust) generated when preparing coated surfaces for refinishing.

The vacuum sanding system interfaces well with site operations, minimizes site clean-up, and provides a safer, healthier work environment.

PREVIOUS METHOD: Sanding/Grinding Metal and Composite Aircraft Structures

Consumables

TBD

Labor

TBD

Waste Disposal

TBD

Total Annual Costs

Item	**Cost**
Consumables	TBD
Labor	TBD
Waste Disposal	TBD
Total	TBD

NELP METHOD: Vacuum Sanding System

Consumables

TBD

Labor

TBD

Waste Disposal

TBD

Total Annual Costs

Item	**Cost**
Consumables	TBD
Labor	TBD
Waste Disposal	TBD
Total	TBD

COST ANALYSIS SUMMARY (PER YEAR)

Sanding/Grinding Metal and Composite Aircraft Structures	TBD
Vacuum Sanding System	TBD
Cost Change per Year	TBD
Initial Procurement	$4,954.67
Expected Service Life	TBD
Return on Investment (per 10-year period):	TBD
Break Even	TBD

PREPRODUCTION INITIATIVE-NELP
VACUUM SANDING SYSTEM
TEST PLAN

1.0 OBJECTIVE

This test plan describes the data collection procedure for the vacuum sanding system (VSS), which is primarily used to remove paint from radomes. The data will be used to determine the efficiency, effectiveness, overall performance of the unit, and the unit's ability to interface successfully with site operations.

2.0 DESCRIPTION

The VSS combines an explosion-proof vacuum cleaner with vacuum assist sanders to eliminate toxins (including lead, chromium, and dust) during surface preparation operations involving both metallic and nonmetallic aircraft structures. The system incorporates a 3-stage filtration process that includes a filter bag, a prefilter, and a high-efficiency particulate air (HEPA) filter. The system includes: one vacuum cleaner, two vacuum assist sanders, two vacuum assist grinders, one package of 6 mil polyliners, one Y adapter, one package of filter bags, two packages of prefilters, and one tool caddy. The system is designed to be in compliance with Occupational Safety and Health Act (OSHA) Standard 1910.1025 and Office of the Chief of Naval Operations Instruction (OPNAVINST) 5100.23D for use during sanding and grinding operations.

3.0 TEST PLAN

This test plan will be used to evaluate the effectiveness of the vacuum sanding system in eliminating toxins during surface preparation operations. At all times, the VSS unit should be operated according to manufacturer instructions. The radomes should be carefully inspected both before and after sanding/grinding operations to determine effectiveness and whether or not the radomes are being damaged. Safety and ergonomic considerations for this application will also be assessed.

3.1 Approach

Quantitative and qualitative data will be acquired by completion of Table 1.

3.1.1 Instructions for Completing Table 1

- **Date:** Indicate dates the VSS unit was used.

- **Radome Part Number:** Record the part number of the radome that was sanded.

- **Time:** Record the time required to use the vacuum sanding for a particular part number radome. The time required to sand the same part using the old method should also be recorded.

- **Consumables:** How many consumables (if any) were used for a given operation. In addition, indicate whether the consumables were sandpaper, filter elements, or other items.

- **Hand-Sanding:** Record whether any hand-sanding of the part was required following use of the VSS unit. Be sure to specify the time that was required.

- **Damage to Part:** Record any evidence of damage to the part caused by the VSS unit. Note any damage exacerbated through use of the equipment. Also note if the damage was due to over-sanding *(i.e.*, sanding through the coating and damaging the substrate underneath) or other causes. If damage was due to other causes, describe them in detail in the qualitative assessment.

- **Qualitative Assessment:** Provide a narrative evaluation of the sanding and grinding abilities of the VSS unit. Briefly discuss:

  - Efficiency of the unit (*e.g.*, time and cost savings)

  - Ease of use and the unit's ability to successfully interface with other site operations

  - Overall satisfaction with the vacuum sanding set. Compare overall satisfaction to the results of sanding using other methods.

4.0 REPORTING

The data entry forms provide a concise method of data collection. Forms should be completed on a daily basis. Data will be collected for 1 year. During this time, periodic status reports on the testing will be submitted to NAWCADLKE. The final report will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations.

Table 1

Date	Radome Part Number	Time		Consumables		Hand-Sanding	Damage to Part
		New Method	Old Method	Number	Type		

Qualitative Assessment*:
Please comment on the effectiveness and efficiency of the unit.

____

____

____

____

*Attach extra sheet if required.

PREPRODUCTION INITIATIVE-NELP
WALK-IN MULTIMEDIA BLASTING BOOTH
GENERAL DESCRIPTION

P2 Opportunity: Provide state-of-the-art multimedia blasting booth for removal of paint coatings from fiberglass structures while efficiently collecting removed materials.

Equipment Description: A stationary blast booth and adjoining equipment shelter capable of fully enclosing 18 foot long antennae sections, radomes, and multiple life raft canisters for paint coating removal operations. The blast mechanism is compatible with various types of blasting media.

Implementation Requirements:

- Air Supply: 2" line, 60 to 100 psi
- Foundation: Concrete pad, approximately 22' x 40' plus ramp
- Electrical: 70 amps/460 VAC (200 amp service panel provided)

Benefits:

- Provide enclosure to remove paint coatings from 18 ft. long antennae sections and other equipment.
- Provide for environmentally safe collection and subsequent disposal of all removed paint particles.
- Provide a safe operating environment for operator personnel.
- Reduce time required to perform select operations.

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Technical Activity POC:	Gabrielle Korosec, 4.8.1.4	Tel: (908) 323-7130
Vendor(s):	Pauli Systems (Blast Booth)	Model: N/A
FY/Site(s):	1995 NELP Initiative, NS Mayport	
Cost:	$220,357 (1 system)	

PREPRODUCTION INITIATIVE-NELP
WALK-IN MULTIMEDIA BLASTING BOOTH
COST ANALYSIS

PROTOTYPE SITE: NS Mayport

DESCRIPTION: This walk-in blasting system is designed for use with both sodium bicarbonate and plastic blasting media to remove paint from laminated and composite surfaces. It is sized to accommodate two to eight life raft canister (MARK V) sections or one to four AS-2537C/SR whip antennae sections. Use of sodium bicarbonate or plastic as a blasting media minimizes the potential for damage to structure substrates, expedites the stripping process, and significantly reduces wastestream volume.

DATA COLLECTION PERIOD: To be determined

COST SAVINGS: Environmental benefits result from the use of sodium bicarbonate as a blast media, especially in the reduction of wastestream volume. Because the sodium bicarbonate will dissolve into solution, the coating fines can be removed from the solution via filtration. Presently, the sodium bicarbonate in solution can go into sanitary sewers.

Environmental benefits for plastic media are achieved via media reclamation. The blast media is easily separated from the coatings removed in the blast process. PMB fines and paint fines are removed from the recyclable plastic media with the high-efficiency reclaim system, which substantially separates all paint dust and media fines from recyclable media. Because a large percentage of the media is recyclable, the replenishment costs are minimized, as well as those associated with the wastestream volume.

PREVIOUS METHOD: Mechanical Removal

Consumables

TBD

Labor

TBD

Waste Disposal

TBD

Total Annual Costs

Item	**Cost**
Consumables	TBD
Labor	TBD
Waste disposal	TBD
Total	TBD

NELP METHOD: Walk-In System Using Sodium Bicarbonate/Plastic Blast Media

Consumables

TBD

Labor

TBD

Waste Disposal

TBD

Total Annual

Item	**Cost**
Consumables	TBD
Labor	TBD
Waste disposal	TBD
Total	TBD

COST ANALYSIS SUMMARY (PER YEAR)

Mechanical Removal	TBD
Walk-In System Using Sodium Bicarbonate/ Plastic Blast Media	TBD
Cost Change per Year	TBD
Initial Procurement	TBD
Expected Service Life	TBD
Return on Investment (per 10-year period):	TBD
Break Even	TBD

PREPRODUCTION INITIATIVE-NELP
WATER JET BLASTING BOOTH COATING REMOVAL SYSTEM
GENERAL DESCRIPTION

P2 Opportunity: Use high-pressure water to remove coatings from engine components. Eliminate use of solvents and dry blasting procedures.

Equipment Description: A state-of-the-art, high-pressure water jet spray system using robotics to control spray and nozzle movement.

Implementation Requirements:

- Installation by manufacturer.
- Electrical power and water to be supplied by NADEP Jacksonville.

Benefits:

- Use a closed-loop water recirculation system that filters removed coating material.
- Reduce volume of hazardous waste by eliminating use of dry blast media.
- Provide a safer work environment by eliminating hand-held blast nozzles and solvents.

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Technical Activity POC: Eric Hatke, 4.8.2.5 — Tel: (908) 323-2964

Vendor(s): Waterjet Systems
Div. of United Technologies/Pratt & Whitney — Model: Engine ARMS Decoating System

FY/Site(s): 1995 NELP Initiative, NADEP Jacksonville

Cost: $799,750 (1 unit)

PREPRODUCTION INITIATIVE-NELP
WATER JET BLASTING BOOTH COATING REMOVAL SYSTEM
COST ANALYSIS

PROTOTYPE SITE: NADEP Jacksonville

DESCRIPTION: A state-of-art robotized system that uses an ultra-high-pressure water jet to remove various coatings from engine parts without damaging substrate material.

DATA COLLECTION PERIOD: November 1995 - May 1996

COST SAVINGS: Use of the Engine ARMS for decoating provides environmental and cost benefits by minimizing the disposal of hazardous waste and using closed-loop water recirculation and automated cleaning processes. It also significantly reduces damage to expensive engine parts.

PREVIOUS METHOD: Acid Dip Combined with Blasting

In the conventional stripping process, parts are first dipped in an acid bath to soften the coatings. The parts are then blasted with abrasive media to remove the flame spray coating. Damage can occur during both the acid dip and blasting processes. Obviously, blasting can potentially physically damage parts, but parts can also be condemned if the serial numbers become unreadable. In addition, many parts are made of alloys that have limited acid exposure times due to the danger of pitting and intergranular attack—both of which can adversely affect the integrity of the metal. Once the time limit is reached, the part is condemned. The following data is based on a throughput of 2,500 parts per year.

Consumables

Cost of nitric acid per gallon: $13.35
Gallons used per year: 1,440
Cost per year: $19,224.00

Cost of abrasive media per pound: $0.22
Pounds used per year: 11,250
Cost per year: $2,475.00

Parts cleaned per year: 2,500
Blast cycles per part: 2
Hours per part per cycle: 0.25
Kilowatt-hours per hour: 10
Cost per kilowatt-hour: $0.035
Energy required for dry blast process per year: $437.50

Cost of spare parts and materials to maintain dry blast media equipment per year: $10,000.00

Labor

Number of operators: 4 (1 operator for nitric acid dip process; 3 operators for dry blast media process)
Labor rate per hour for operators: $15.00
Hours per day: 8
Days per year: 250
Total cost per year: $120,000.00

Disposal Costs

Cost of nitric acid per gallon: $10.00
Gallons used per year: 1,440
Cost per year: $14,400.00

Cost per nitric acid collection drum: $75.00
Drums used per year: 32
Cost per year: $2,400.00

Cost of abrasive media per pound: $1.24
Pounds used per year: 11,250
Cost per year: $13,950.00

Cost per abrasive media collection drum: $75.00
Drums used per year: 25
Cost per year: $1,875.00

Damaged Parts

Average cost of damaged part: $12,600.00
Parts damaged per year: 90
Cost for damaged parts replacement per year: $1,134,000.00

Total Annual Costs

Item	Cost
Consumables	$32,136.50
Labor	120,000.00
Disposal Costs	32,625.00
Damaged Parts	1,134,000.00
Total	$1,318,761.50

NELP METHOD: High-Pressure Water Jet System

The robotized water jet system uses only ultra-high-pressure, filtered, and recirculated water to remove coatings from engine parts. The filtered particulate is evaluated and disposed of in accordance with local codes. The following data is based on a throughput of 2,500 parts per year.

Consumables

Spare parts, labor, and materials to maintain water jet unit 8 hours per day for 250 days per year: $44,000*

Parts cleaned per year: 2,500
Hours required per part: 0.33
Kilowatt-hours per hour: 10
Cost per kilowatt-hour: $0.035
Energy for spraying: $288.75

* Manufacturer estimate of $22 per operating hour.

Labor

Number of operators: 2
Labor rate per hour for operators: $20.00
Hours per day: 8
Days per year: 250
Total cost per year: $80,000.00

Disposal Costs

Pounds of filters and coatings per year: 300
Disposal cost per pound: $1.24
Cost per year: $372.00

Cost per drum for disposal: $75.00
Drums used per year: 1
Cost per year: $75.00

Parts Damaged

Insignificant

Total Annual Costs

Item	Cost
Consumables	$44,288.75
Labor	80,000.00
Disposal Costs	447.00
Damaged Parts	0.00
Total	$124,735.75

COST ANALYSIS SUMMARY (PER YEAR)

Acid Dip Combined With Blasting	$1,318,761.50
High-Pressure Water Jet System	$124,735.75
Cost Change per Year	$1,194,025.80
Initial Procurement	$799,750.00
Expected Service Life	10 years
Return on Investment (per 10-year period):	$11,140,508.00 [10 x $1,318,761.50] - [$799,750.00 + (10 x $124,735.75)]
Break Even	0.67 years [$799,750.00 / $1,194,025.80]

PREPRODUCTION INITIATIVE-NELP
WATER JET BLASTING BOOTH COATING REMOVAL SYSTEM
FINAL REPORT

NADEP JACKSONVILLE, FL

1.0 INTRODUCTION

The U.S. Navy has adopted a proactive and progressive position toward protecting the environment and complying with environmental laws and regulations. Rather than merely controlling and treating hazardous waste by end-of-the-pipe measures, the Navy has instituted a program for Pollution Prevention (P2) to reduce or eliminate the volume and toxicity of waste, air emissions, and effluent discharges.

P2 allows the Navy to meet or exceed current and future regulatory mandates and to achieve Navy-established goals for reducing hazardous waste generation and toxic chemical usage. P2 measures are implemented in a manner that maintains Navy readiness. An additional benefit has been a general increase in operational efficiency.

The Navy has truly set the standard for the procurement and implementation of P2 equipment. The Chief of Naval Operations (CNO), Environmental Protection, Safety, and Occupational Health Division (N45), established the P2 Equipment Program, through which both the Naval Air Warfare Center Lakehurst (NAWCADLKE) and the Naval Facilities Engineering Service Center (NFESC) serve as procurement agents under the direction of (N45). P2 equipment is specified and procured under two complementary initiatives, the Preproduction Initiative (*i.e.,* technology demonstration) and the Competitive Procurement Initiative. The Preproduction Initiative directly supports both the Navy Environmental Leadership Program (NELP) for P2 shore applications and the P2 Afloat program, which prototypes and procures P2 equipment specific to the needs of ships.

This report provides an analysis of the procurement, installation, and operation of P2 equipment under the Preproduction Initiative. Technology demonstrations and evaluation were primarily performed under NELP at two designated NELP sites, NAS North Island and NS Mayport. Additional sites, in this case, NADEP Jacksonville, have been added as required to meet mission goals. The program involves defining requirements, performing site surveys, procuring and installing equipment, training operators, and collecting data during an operational test period. The equipment is assessed for environmental benefits, labor and costs savings, and ability to interface with site operations.

2.0 BACKGROUND

Previously, NADEP Jacksonville used a nitric acid bath followed by dry blasting to remove thermal spray coatings from gas turbine engine components. The parts were soaked for 5 to 10 hours in the nitric acid bath and then blasted using plastic media blast (PMB). This two-step process was labor-intensive, generated large quantities of hazardous waste, and relied on the use of hazardous materials. The process also had the potential for damaging the engine parts. Parts were frequently damaged and termed condemned due to prolonged acid exposure or removal of material beyond specified tolerances during blasting. It was estimated by the site that approximately 90 parts per year were condemned, with each part having an average value of $12,600.

The P2 goals are to eliminate or reduce the use of hazardous materials, the generation of hazardous waste, and the incidence rate of damaged engine components.

After conducting vendor research, the Engine Automatic Robotic Maintenance System (ARMS) model from Waterjet Systems, a division of United Technologies/Pratt & Whitney, was selected as the best candidate to meet the requirements of the site as well as the P2 program. Engine ARMS is a state-of-the-art, high-pressure water jet spray system that uses robotics to control spray and nozzle movements.

3.0 EQUIPMENT DESCRIPTION

A typical Engine ARMS contains: a six degree-of-freedom (6-DOF) industrial robot; 90°, 135°, or 180° end effectors, with computer-designed, application-specific, process-tested water jet nozzles; a 7-axis robot controller (expandable to 8-axis and configurable to 16-axis) with PC-based graphic operator’s workstation; a turntable sized for 48-, 60-, or 120-inch diameter components, rotating at up to 5+ rpm for one-pass decoating of round components, or indexing one degree at a time for decoating other complex-geometry components using robot motion; high-pressure pump that delivers blasts of water at up to 55,000 psi and 2.9 gallons per minute (gpm) (low volume); and a water filtration and reclamation closed-loop system for total isolation and reuse of process water.

3.1 Specifications

- Size: 128" diameter x 105" high
- Weight: 500 lb. (minimum)
- Capability: 55,000+ psi
- Automation: Six degree-of-freedom, articulated robotic arm and turntable design.

3.2 Implementation Requirements

- Installation by manufacturer
- Electrical: 200-575 VAC, 3 phase, 50/60 Hz and 100-120 VAC, single phase, 50/60 Hz
- Water supply: 3-5 gpm, 60-80 psi

3.3 Benefits

- Uses a closed-loop blast water recirculation system that filters removed coating material.
- Reduces volume of hazardous waste by eliminating the use of dry blast media and hazardous solvents.
- Provides a safer work environment by eliminating hand-held blast nozzles and hazardous solvents.
- Reduces costs due to damaged parts.

4.0 DATA ANALYSIS

Data was collected at NADEP Jacksonville for this piece of equipment from November 1995 to May 1996 (provided to NDCEE for analysis).

4.1 Quantitative Analysis

Compared with the old method of using hazardous solvents and dry blasting to clean the engine components, the water jet coating removal system has a return on investment (per 10-year period) of $11,140,508.00 per unit. The break-even point is 0.67 years. Refer to the Cost Analysis for complete data.

4.2 Qualitative Analysis

4.2.1 Installation

The Engine ARMS is a closed-loop water recirculation system requiring electrical power and a water supply. The manufacturer performed all installation and set-up tasks. The unit was delivered to the site in July 1995 and became operational in November 1995. From July until November, various facilities work had to be performed, such as power and wall modifications.

4.2.2 Training

Pratt & Whitney, the manufacturer of the Engine ARMS, supplied on-site training for the unit once installation was complete. This training was included in the price of the unit.

4.2.3 Maintainability

It has been noted that the seals on the unit have a tendency to break. The operator also noticed a shorter seal life as time goes by. The manufacturer stated that such occurrences are typical of the unit. The manufacturer also stated that maintenance costs for the system are estimated to be $20 to $22 per operating hour, including spare parts and labor. Another minor problem was reported with water reclamation because the plasma coatings removed from the engine components tend to clog the filter. NADEP Jacksonville plans to place an additional filter further upstream to try to solve this problem.

4.2.4 Interface with Site Operations

There are three models of engines that are currently processed using the water jet coating removal system—the F404, the J52, and the TF34. Various parts from each of these units are currently being cleaned with the new system. The automated process has greatly reduced labor hours, damaged parts, and the generation of hazardous waste caused by the old process. The high-pressure water is intense enough to remove the flame spray coatings without first having to soften the coatings with an acid bath. The programmed robotic arm eliminates damage that can occur when blasting close tolerance parts by hand.

4.2.5 Overall Performance

The site highly recommends the unit and is very pleased with its performance.

5.0 LESSONS LEARNED

- Analyze the actual waste generated by the water jet coating removal system to ensure that the filtering system is sufficient.
- Look into a more reliable seal that will not break as easily and will not lose its life as the unit ages.
- The robotic system successfully eliminates the problems created by the old method.

6.0 CONCLUSIONS

The water jet coating removal system provides many benefits to the end user and the environment:

- Reduces the volume of hazardous waste.
- Provides major cost savings by reducing unnecessary labor hours, hazardous solvents, and damaged parts.

The results of this study indicate that the water jet coating removal system is an excellent system for Navy facilities that currently remove coatings from engine components.

PREPRODUCTION INITIATIVE-NELP
WATER LEAD ANALYZER
GENERAL DESCRIPTION

P2 Opportunity:	Navy buildings frequently have old water pipes that may yield levels of lead in drinking water that exceed National Primary Drinking Water Standards (40 CFR 181). OPNAVINST 5090.1B requires sampling for lead in all water coolers at Navy activities and in all water outlets at priority facilities, such as maternity wards. A rapid and accurate technique is needed to measure lead in drinking water.
Equipment Description:	Two units will be procured and tested as part of this preproduction project—a portable metals analyzer and a flow-through metals analyzer. The portable unit is a hand-held, battery-operated instrument that can accurately and reliably detect trace metals in water within 3 minutes. The disposable sensor design prevents cross-contamination during sampling with each new reading. It reads to parts per billion levels by using potentiometric striping analysis (PSA). The flow-through unit being tested is designed for unattended collection and analysis of trace metals in water using PSA. It has an embedded 486 computer, which permits real-time data logging and remote data access by modem.
Implementation Requirements:	Vendor will supply operation and maintenance manuals for the hand-held units. The portable metals analyzer has no special implementation requirements. The flow-through analyzer requires a connection to the water pipe and a source of power (2 A at 115 VAC). The flow-through unit can be operated by battery with a converter unit.
Benefits:	• Provide rapid, accurate techniques to measure lead in drinking water. • Provide portable unit for sampling at several sources. • Flow-through unit allows unattended collection and analysis of data.
Other Information:	None

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Vendor(s):	Environmental Technologies Group	Model: Metalyzer 3000 & Metalyzer 4000
FY/Site(s):	1995 NELP Initiative, Washington Navy Yard	
Cost:	$20,500 (3 units)	

COMPETITIVE INITIATIVE
55-GALLON DRUM CRUSHER
GENERAL DESCRIPTION

P2 Opportunity: Reduce the volume of solid waste that must be disposed of by compacting 55-gallon drums. The 55-gallon drum crusher unit facilitates handling and storage of drums until they are disposed of or recycled.

Equipment Description: The 55-gallon drum crusher unit uses a single-lever hydraulic control to crush drums down to 7" pancakes. The unit also has in-drum compaction capabilities.

Implementation Requirements:

- Foundation: Concrete slab recommended.
- Size: 40" wide x 40" deep x 110" high, 1,600 lb
- Weather protection: Overhang is recommended if unit is to be placed outside.
- Electric: 208V, 3 phase

Benefits:

- Reduce labor for drum handling operations.
- Reduce volume of solid waste.
- Reduce waste disposal costs.

Other Information: If the crushed drums are to be recycled, a local recycler and acceptance criteria must be identified. Applicable solid and hazardous waste regulations may require research to define "empty drums." Drums turned in for crushing may need to be monitored to ensure they meet acceptance criteria for cleanliness, previous use, and residues.

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Vendor(s): S&G Enterprises, Inc. — Model: 55DR-HY

Cost: $28,365

COMPETITIVE INITIATIVE
55-GALLON DRUM CRUSHER
TECHNICAL SPECIFICATION

This specification covers the salient characteristics for a commercially available 55-gallon drum crusher, which will be used to crush the 55-gallon drums. The manufacturer shall have been in production with their commercial 55-gallon drum crusher for at least 1 year. The unit is designed to meet requirements under Executive Order 12088, “Federal Compliance with Pollution Control Standards,” signed October 13, 1978.

Facility Interface Requirements:

Overall Dimensions: Not to exceed 40" wide x 110" high
Power Requirements: 208 V, 60 Hz, 3 phase; will draw less than 15A operating under a full load
Other: Unit shall be delivered complete and ready for use upon being filled with hydraulic oil and connected to a power source. Cement slab shall be required for placement of unit. If unit is to be situated outdoors, a roof overhang should be provided.

Classification:

The unit shall include all equipment required to perform its intended purpose.

Environment:

The unit will be used in areas exposed to marine environments, which is understood to mean changing ambient temperatures, high humidity in salt-laden atmospheres, and high incidence of conditions for electrolytic action of dissimilar metals. The unit shall be capable of being stored, operated, or exposed to temperatures ranging from 0• to 125• F and exposed to a relative humidity of up to 100% in rain and salt fog.

Safety:

To protect personnel against hazards and accidents, the unit shall incorporate the following minimum safeguards and protective features:

a. Exposed moving and rotating parts shall be covered by removable guards of expanded metal or similar serviceable material.

b. Exposed edges shall be generously rounded and made smooth to prevent cutting edges and sharp corners.

c. Pressurized components and systems shall be safeguarded against sudden and catastrophic rupture by:

   1. Pressure testing assemblies and components to 150% of anticipated operating pressure during construction

2. Non-destructive testing of welds and joints

3. Installation of pressure relief, safety devices, and monitoring controls.

Materials:

Materials used in the construction of the unit shall be of commercial quality and suitable for the intended application. Parts other than corrosion-resistant materials shall be protected against corrosion after fabrication with environmentally-sound chemicals, electrolytic process, plating, or suitable non-lead paints and enamels. Paints shall not be used where disassembly for maintenance or repair will reduce or eliminate the effectiveness of corrosion protection. Cadmium plating shall not be used as corrosion protection. Asbestos shall not be used.

Fasteners:

All screws exposed in final assembly shall be corrosion-resistant steel. The corrosion-resistant material shall be non-galling in the threaded application. All other external fasteners (such as bolts, nuts, pins, and screws) shall be of the same material being joined or supported or shall be cathodic to the materials being joined or supported. Sheet metal or self-tapping screws shall not be used.

System Assembly:

The system shall be assembled using hardware and construction practices that prevent parts from working loose in service. The unit shall be capable of withstanding stresses, shock, vibration, and conditions incident to shipping, storage, and usage and shall provide maximum ease and safety of operation. All components shall be readily accessible for operation, maintenance, and repair. All loose parts and accessories shall be adequately attached or stored on the unit for transport.

The system shall include safety devices to protect equipment and personnel against excessive pressure or hazards incident to operation. Gages, controls, and other instrumentation shall be provided to monitor all unit functions specified herein.

Drum Crusher Full Cycle Time: Not more than 60 seconds to cycle one 55-gallon drum
Delivery: The unit shall be delivered with all components necessary to perform the above functions. Spare parts required for a 6 month operation period shall also be delivered.

System Design:

The system shall include: heavy duty electric motors, hydraulic components and other devices and controls necessary to perform the functions described above. The unit shall be completely enclosed in a reinforced steel-plate chamber. The unit shall have a safety interlock system that will prevent operation unless the steel door is closed.

The unit shall conform to National Electrical Manufacturers Association (NEMA) requirements. The electrical power cord shall be at least 10 feet long. The cord and plug shall be a grounded type with a ground fault interrupter. The apparatus shall be a grounded type. The apparatus shall be capable of withstanding a dielectric strength test for a period of 1 minute.

Controls shall comply with safety standards of UL 508. The insulation resistance of the electrical circuit shall not be less than 1 megohm.

COMPETITIVE INITIATIVE
ABSORBENT PAD WRINGER
GENERAL DESCRIPTION

P2 Opportunity: Per Executive Order 12873, DOD has established a 50% solid waste recycling goal for CY 1999. An Absorbent Pad Wringer is used to remove fluids from absorbent pads, thereby enabling the pads to be reused.

Equipment Description: The Absorbent Pad Wringer is a heavy-duty, manually operated wringing system for reclaiming non-aggressive fluids from absorbent pads. It is typically used where waste disposal of non-aggressive fluids is desired and mandated by regulatory law. A 12" wide throat adjusts from 0" to 2" height, which allows the wringing of various size absorbent pads, socks, mats, skimmers, and booms. A feed and catch tray allows for easier handling of the saturated absorbent pads. Polyurethane grip rollers incorporating a chevron design provide a non-slip surface that prevents spinning and channels fluids away from the absorbent pad and into the collection drum, where it can be reused, recycled, or disposed of separately from the solids.

Implementation Requirements:

- Mounts on drum heads of various diameters (drum not included)

Benefits:

- Reduces cost of disposal of used absorbent pads by allowing them to be reused.
- Minimizes the amount of waste by removing up to 79% of the fluid from a saturated absorbent pad.

Other Information: GSA Vendor

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Vendor(s): New Pig — Model: RNG202

Cost: $765

COMPETITIVE INITIATIVE
AEROSOL CAN PUNCTURER
GENERAL DESCRIPTION

P2 Opportunity: Navy activities generate large quantities of aerosol paint cans and other aerosol containers. These cans must be disposed of as hazardous waste. The puncturer safely removes the liquid contents so the containers may be disposed of as solid waste.

Equipment Description: The unit is a hand-operated, single-drum, aerosol container puncturer. The puncturing unit threads directly to the 2” bung of 20-, 30-, or 55-gallon drums. A combination filter, which collects VOCs and propellant liquids, threads to the 3/4" bung of the drum. During the puncturing operation, the residual liquids drain directly into the storage drum for eventual removal as hazardous waste.

Implementation Requirements: The two parts of the unit must be threaded to the respective bungs of a collection drum before operation. Puncturing operations should be performed in an area that is covered, paved, bermed, and well-ventilated.

Benefits:

- Allows containers to be disposed of as solid waste instead of as hazardous waste.

Other Information: None

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Vendor(s): Waste Control Systems, Inc. — Model: Aerosolv
Model 5100

Cost: $805

COMPETITIVE INITIATIVE
AQUEOUS PARTS WASHER (LARGE)
GENERAL DESCRIPTION

P2 Opportunity: Use a non-hazardous, biodegradable aqueous detergent in a closed-loop parts cleaning system as a substitute for 1,1,1 trichloroethane in cleaning operations. Replace ultrasonic cleaners, vapor degreasers, and solvent tanks at the I-level.

Equipment Description: Aqueous parts washers are cleaning cabinets with spray nozzles positioned along the interior walls and ceiling that direct a heated, high-pressure stream of water and detergent at parts to be cleaned. The combination of high temperature and high blasting pressure removes dirt, grime, oil, grease, and fluorescent penetrants.

Implementation Requirements:

- Electric: 240V, 3 phase (with purifier filtration system)
- Water: Standard building gpm flow rate
- Ventilation: Not required, but recommended for low-ceiling or confined locations

Benefits:

- Reduce labor time to clean parts—25% compared with Safety Kleen tank and 50% compared with P-D-680 tanks.
- Replace hazardous solvents with a biodegradable detergent.
- Reduce disposal costs of hazardous waste.
- Provide a healthier work environment.
- Reduce quantity and toxicity of waste stream—45% compared with P-D-680 tanks and 27% compared with Safety Kleen tanks.

Other Information: Sludge must be periodically removed from unit sludge trap and disposed of as solid waste. Authorization may be required to clean certain parts using this method.

Procuring Activity Manager:	Jill MacIntyre, 1.1.X.7.1.J.B Naval Air Warfare Center, Aircraft Division Lakehurst, NJ	Tel: (908) 323-1936
Technical Activity POC:	Chris Mahendra, 4.8.2.5	Tel: (908) 323-7131
Vendor(s):	Better Engineering Manufacturing, Inc.	Model: F-4000-P
Cost:	$14,769	

COMPETITIVE INITIATIVE
AQUEOUS PARTS WASHER (LARGE)
TECHNICAL SPECIFICATION

Better Engineering Aqueous Parts Washer Model F-4000-P is a large cleaning cabinet with spray nozzles along the interior walls and ceiling that blasts an environmentally safe detergent in an aqueous solution onto soiled parts. The system is entirely closed-loop, with no water discharge. The combination of high temperature and strong blast pressure enables the washers to remove the contaminants from the parts. The unit shall incorporate features including a purification filtration system, steam exhaust systems, oil skimmer and separator, seven-day timer, parts basket and bag filter, as described below.

Facility Interface Requirements:

Overall Dimensions: 63" wide x 72" deep x 72" high
Power Requirements: 220 V, 3 phase, 60 Hz, 59 A
Water Requirements: Standard pressure (<125 psi) water line. Water is used for replenishing solution, for low water shutoff safety feature, and for rinsing parts.
Space Requirements: Minimum of 18" clearance required for access to oil skimmer and electric box.
Sludge Removal: Unit sludge trap has a volume of 30 gallons. Sludge is accessible for removal via shovel or other means. Floor drain shall be on shorebased units only.
Ventilation: Six-inch steam exhaust vent provided for automatic venting of water vapor created during operation to the outside of the building.
Other: Instructions and drawings shall be provided by the vendor to aid in installation.

Minimum Requirements:

Work Area: 1260 square inch turntable area, 40" work height (minimum)
Turntable: 1500 lbs weight capacity; 3 rpm rotation speed
Tank Capacity: 140 gallon main tank
Filtration: Process which uses gravity to trap oils and particles before they reach the main tank.
Insulation: Minimum one-inch polystyrene layer for heat retention during operation.
Sludge Removal/Oil Separation: 25 to 30 gallon sludge trap volume.
Controls: 30 minute wash timer; adjustable thermostat
Pump motor: 5.0 horsepower
Nozzles: Shall be constructed of mild steel, arranged vertically along the sides and horizontally above and below the turntable to ensure that the entire surface of the aircraft parts come in contact with the spray. Each nozzle shall blast in its own plane without interference from other nozzles.
Blast Pressure: Minimum blast pressure shall be 48 psi when equipped with the bag filter option. The washer shall be equipped with a water pressure gauge.
Ventilation: Automatic venting of water vapor created during operation to the outside. Six-inch steam exhaust vent provided.

Cycle Temperature Requirements: The parts washer shall utilize an electric heat source capable of maintaining a water temperature of 200°F. The temperature shall be adjustable, and the heat source shall be capable of raising the temperature to 200°F in two hours. The parts washer shall be equipped with a water temperature gauge.
Heating system: 24 kW electric heat source
Electronics: The parts washer shall have electronic devices and controls that are silicon gasketed and sealed throughout so they are watertight. The unit shall be in compliance with NFPA 79 Electrical Standard for Industrial Machinery.
Displays: Shall be rotary dials rather than LED type
pH Meter: A titration kit or hand-held pH meter shall be provided so that the solution can be checked daily to ensure that the pH and concentration are at their optimum levels.

<u>Optional Features Included with Each Unit</u>:

FEATURE DESCRIPTION

0001 **Oil Skimmer and Separator**
Better Engineering Oil Skimmer and Separator, P/N OSW-11, is a skimmer that automatically removes a minimum of 1.5 gallons of emulsified oils from the surface of the wash reservoir every hour. This device deposits the oils into a container for disposal.

0002 **Low Water Safety Control**
Better Engineering Low Water Safety Control, Model LWS-F1, is a low water level safety switch that will shut off power to the heating elements if the water drops below a safe level. This will serve to protect the heating elements from burnout. An indicator light flashes to show the operator the reason for shut-down of the heating elements. In addition, the parts washer unit shall prevent further ingress of water in the event of full water condition to prevent the water from overflowing into the shop area.

0003 **Seven-Day Timer Model**
Better Engineering Seven-Day Timer, Model ATC-24, is a device that automatically turns the heater on and off, thereby allowing the solution to be pre-heated and ready for use at the beginning of the day. It is a 24-hour, 7-day, skip-a-day automatic adjustable timer with battery backup that can be set from 0 to 30 minutes in increments of one minute.

0004 **Small Parts Basket**
Better Engineering Small Parts Basket, Model SPB-11, is placed inside the cleaning chamber of the unit. The basket shall be constructed from stainless steel wire mesh with 1/4 inch or 3/4 inch openings and 3/8 inch stainless steel rods throughout. The minimum interior dimensions of the basket shall be 11 1/2 inches in length by 6 inches in width by 6 inches in height. The parts basket shall be able to withstand the temperature and water pressure exerted on it by the parts washer. The basket shall have a hinged lid and lift bar. The parts basket is able to support 100 lbs.

0005 **Bag Filter**

Better Engineering Bag Filter, Model ILF-22, is a micron selectable and replaceable bag filter installed at the washer pump to prevent large particles from being blasted back onto the parts. The size of the filters shall be in the range of 100 to 150 microns.

0006 **Automatic Steam Exhaust System**

Better Engineering Exhaust System, Model ASX-11, is designed to automatically vent water vapor created during cleaning operations to a ventilation system so that it will be removed from the building/enclosure. The vent shall be at least eight inches in diameter and extend at least two inches above the unit to allow for exhaust stack connection. The exhaust blower assembly shall have a minimum 1/2 horsepower ventilation motor, and shall be installed on the steam vent.

0007 **Liquid Detergent**

Giant Cleaning Systems powder detergent Natural Orange NAT-50 shall display the following characteristics:

- The detergent is intended for use in power washers/spray cabinets for cleaning of aircraft components.
- The detergent will remove oily contaminants which are present on disassembled aircraft components.
- The concentrated detergent shall have no adverse effect on the health of personnel when used for its intended purpose.
- Surface active agents used in the cleaning compound shall be at least 90% biodegradable.
- The detergent should be alkaline, low-foaming, and contain a rust inhibitor.
- A titration kit shall be supplied with the detergent in order to check that the detergent meets manufacturer's recommended concentration. The manufacturer shall provide the following information:

    1. Certification stating that the material contains no carcinogens, heavy metals, total toxic organics, volatile organic compounds, or hazardous air pollutants.

    2. Material safety data sheets

    3. Certification stating that no change shall be made to the product formulation without notifying the Navy activity to which the product has been shipped.

COMPETITIVE INITIATIVE
AQUEOUS PARTS WASHER (SMALL)
GENERAL DESCRIPTION

P2 Opportunity: Use a non-hazardous, biodegradable aqueous detergent in a closed-loop parts cleaning system as a substitute for 1,1,1 trichloroethane in cleaning operations. Replace ultrasonic cleaners, vapor degreasers, and solvent tanks at the I-level.

Equipment Description: Aqueous parts washers are cleaning cabinets with spray nozzles positioned along the interior walls and ceiling that direct a heated, high-pressure stream of water and detergent at parts to be cleaned. The combination of high temperature and high blasting pressure removes dirt, grime, oil, grease, and fluorescent penetrants.

Implementation Requirements:

- Electric: 220 V, 1 phase, 60 Hz, 59A (shore-based); 440V, 3 phase, 60 Hz, 59 A (shipboard)
- Water: Standard building gpm flow rate
- Ventilation: Not required, but recommended for low-ceiling or confined locations

Benefits:

- Reduce labor time to clean parts—25% compared with Safety Kleen tank and 50% compared with P-D-680 tanks.
- Replace hazardous solvents with a biodegradable detergent.
- Reduce disposal costs of hazardous waste.
- Provide a healthier work environment.
- Reduce quantity and toxicity of waste stream—45% compared with P-D-680 tanks and 27% compared with Safety Kleen tanks.

Other Information: Sludge must be periodically removed from the unit sludge trap and disposed of as solid waste. Authorization may be required to clean certain parts using this method.

Procuring Activity Manager:	Jill MacIntyre, 1.1.X.7.1.J.B Naval Air Warfare Center, Aircraft Division Lakehurst, NJ	Tel: (908) 323-1936
Technical Activity POC:	Chris Mahendra, 4.8.2.5	Tel: (908) 323-7131
Vendor(s):	Better Engineering Manufacturing, Inc.	Model: F-3000-N
Cost:	$8,228	

COMPETITIVE INITIATIVE
AQUEOUS PARTS WASHER (SMALL)
TECHNICAL SPECIFICATION

Better Engineering Aqueous Parts Washer Model F-3000-N is a cleaning cabinet with spray nozzles along the interior walls and ceiling that blasts an environmentally safe detergent in an aqueous solution onto soiled parts. This system is entirely closed-loop, with no water discharge. A combination of high temperature and strong blast pressure enables the washer to remove the contaminants from parts. This unit incorporates such features as a steam exhaust system, oil skimmer and separator, seven-day timer, parts basket and bag filter, as described below.

Facility Interface Requirements:

Overall Dimensions: 54" wide x 62" deep x 72" high
Power Requirements: 220 V, 1 phase, 60 Hz, 59 A (shorebased); 440 V, 3 phase, 60 Hz, 59 A (shipboard)
Water Requirements: Standard pressure (<125 psi) water line. Water is used for replenishing solution, for low water shutoff safety feature, and for rinsing parts.
Space Requirements: Minimum of 18" clearance required for access to oil skimmer and electric box.
Sludge Removal: Sludge is accessible for removal via sump or wet vac. Operator must provide pail for oil skimmer drainage.
Ventilation: Six-inch steam exhaust vent provided for automatic venting of water vapor created during operation to the outside of the building
Other: Forklift cut outs located in front and rear of unit for moving the unit. Instructions and drawings shall be provided by the vendor to aid in installation.

Minimum Requirements:

Work Area: 710 square inch turntable area, 36" work height
Turntable: 750 lbs minimum weight capacity
Tank Capacity: 75 gallon main tank
Blast Cabinet: Stainless steel
Insulation: Minimum one inch polystyrene layer for heat retention during operation.
Controls: 30 minute wash timer; adjustable thermostat
Pump motor: 5.0 horsepower, with output of 50 GPM.
Spray Nozzles: Shall be constructed of stainless steel, arranged vertically along the sides and horizontally above and below the turntable to ensure that the entire surface of the aircraft parts come in contact with the spray. Each nozzle shall blast in its own plane without interference from other nozzles.
Blast Pressure: The blast pressure shall be 55 psi minimum. The washer shall be equipped with a water pressure gauge.
Ventilation: Automatic venting of water vapor created during operation to the outside.

Cycle Temperature Requirements: The parts washer utilizes an electric heat source capable of maintaining a water temperature of 200°F. The electric heat source shall be adjustable and capable of raising the water temperature to 200°F in two hours. The parts washer shall be equipped with a water temperature gauge.
Heating system: Electric heat source, 18 kW
Electronics: The parts washer shall have electronic devices and controls that are silicongasketed and sealed throughout so they are watertight. The unit shall be in compliance with NFPA 79 Electrical Standard for Industrial Machinery
Displays: Shall be rotary dials rather than LED type
Titration Kit: A titration kit shall be provided so that the solution can be checked daily to ensure that the pH and concentration are at their optimum levels.

Optional Features Included with Each Unit:

FEATURE	DESCRIPTION
0001	**Oil Skimmer and Separator** Better Engineering Oil Skimmer and Separator, P/N OSW-11, is a skimmer / separator that automatically removes a minimum of 1.5 gallons of emulsified oils from the surface of the wash reservoir every hour. This device deposits the oils into a container for disposal.
0002	**Low Water Safety Control** Better Engineering Low Water Safety Control, Model LWS-F1, is a low water level safety switch that will shut off power to the heating elements if the water drops below a safe level. This will serve to protect the heating elements from burnout. An indicator light flashes to show the operator the reason for shut-down of the heating elements. In addition, the parts washer unit shall prevent further ingress of water in the event of full water condition to prevent the water from overflowing into the shop area.
0003	**Seven-Day Timer Model** Better Engineering Seven-Day Timer, Model ATC-24, automatically turns the heater on and off, thereby allowing the solution to be pre-heated and ready for use at the beginning of the day. It is a 24-hour, 7-day, skip-a-day automatic adjustable timer with battery backup that can be set from 0 to 30 minutes in increments of one minute.
0004	**Parts Basket** Better Engineering Parts Basket, Model SPB-11, is constructed from stainless steel wire mesh with 1/4 inch or 3/4 inch openings and 3/8 inch stainless steel rods throughout. The basket has a hinged lid and lift bar and is placed inside the parts washer cleaning chamber. The minimum interior dimensions of the basket is 11 1/2 inches in length by 6 inches in width by 6 inches in height. The basket can withstand the temperature and water pressure exerted on it by the parts washer.

0005 **Bag Filter**

Better Engineering Bag Filter, Model ILF-22, is a micron selectable, replaceable filter at the washer pump to prevent large particles from being blasted back on to the parts. The size of the filter is in the range of 100 to 150 microns.

0006 **Automatic Steam Exhaust System**

Better Engineering Automatic Model Steam Exhaust System, Model ASX-11, automatically vents water vapor created during cleaning operations to a ventilation system to be removed from the building/enclosure. The vent is eight inches in diameter and extends at least two inches above the unit to allow for exhaust stack connection. The exhaust blower assembly has a 1/4 horsepower ventilation motor, and is installed on the steam vent.

0007 **Detergent**

Giant Cleaning Systems powder detergent Natural Orange NAT-50 shall display the following characteristics:

- The detergent is intended for use in power washers/spray cabinets for removal of oily contaminants.
- The concentrated detergent shall have no adverse effect on the health of personnel when used for its intended purpose.
- Surface active agents used in the cleaning compound shall be at least 90% biodegradable.
- The detergent should be alkaline, low-foaming, and contain a rust inhibitor.
- A titration kit shall be supplied with the detergent in order to check that the detergent meets manufacturer's recommended concentration. The manufacturer shall provide the following information:

    1. Certification stating that the material contains no carcinogens, heavy metals, total toxic organics, volatile organic compounds, or hazardous air pollutants.

    2. Material safety data sheets

    3. Certification stating that no change shall be made to the product formulation without notifying the Navy activity to which the product has been shipped.

COMPETITIVE INITIATIVE
AVIATION FUEL RECYCLER
GENERAL DESCRIPTION

P2 Opportunity: Recycle JP-5 aviation fuel samples collected and segregated by the squadron for reuse in aircraft. Minimize fuel waste that is currently disposed of or used as lower grade fuel. Institute waste segregation to reduce overall hazardous waste. This opportunity is in accordance with OPNAVINST 4110.2, Hazardous Material Control and Management (HMC&M) program initiatives.

Equipment Description: A typical JP-5 aviation fuel recycling system includes filter/separator vessels, fuel/water separator vessel, 1,000-gpm transfer pump, 15-gpm recirculation pump, motor, 2,000-gallon working tank, and 1,000-gallon clean fuel tank. Each batch of recycled fuel undergoes quality assurance (QA) testing before it is issued to aircraft or blended in stocks.

Implementation Requirements: The NELP prototype system required:

- Electric: 115/220V, 1 phase
- Containment: Bermed concrete pad
- Collection Drums: Locked and labeled “JP-5 Reclaimable Only”
- Transportation: Designated defueler truck
- Procedures: Fuel farm/laboratory QA and squadron segregation standard operating procedures (SOPs)

Benefits:

- Reduce high-grade fuel waste and associated disposal costs.
- Promote waste minimization through reuse of fuel product.
- Decrease quantity of JP-5 to be procured.

Other Information: This program requires participation by squadron personnel to ensure that no other products are commingled with the JP-5. It also requires collection and QA services to be performed by fuel farm personnel.

Procuring Activity Manager: Jill MacIntyre, 1.1.X.7.1.J.B — Tel: (908) 323-1936
Naval Warfare Center, Aircraft Division
Lakehurst, NJ

Technical Activity POC: Ruben Lebron, 4.8.1.6 — Tel: (908) 323-7138

Vendor(s): TBD — Model: TBD

Cost: TBD

COMPETITIVE INITIATIVE
CAN CRUSHER
GENERAL DESCRIPTION

P2 Opportunity:	Navy ship galleys generate large quantities of waste No. 10 cans. These cans take up valuable space on the ship. A crusher may be used to compact the cans, thereby saving space and enhancing the recycling value of the material.
Equipment Description:	Electric, hydraulic, and manual can crushers are available. Electric units crush up to 10 cans per minute to a thickness of 1-1/4”. Manual units achieve 85% compaction and have been successfully used on the USS WASP (LHD-1). Both table-mounted and wall-mounted manual crushers are available.

Implementation Requirements:

- Table or wall for mounting
- Electricity: 115 VAC and 220 VAC models are available

Benefits:

- Enhance recycling value of cans and reduce transportation costs.
- Save storage space (important shipboard consideration).

Other Information:	None	
Procuring Activity Manager:	Mike Viggiano, Code 423 Naval Facilities Engineering Service Center Port Hueneme, CA	Tel: (805) 982-4895
Technical Activity POC:	Brian Swaidan, Code 423 Naval Facilities Engineering Service Center Port Hueneme, CA	Tel: (805) 982-1337
Vendor(s):	Eagle Marketing Group/Edlund Company, Inc.	Model: TBD
Cost:	$5,000	

COMPETITIVE INITIATIVE
CARDBOARD SHREDDER
GENERAL DESCRIPTION

P2 Opportunity:	Per Executive Order 12873, DOD has established a 50% solid waste recycling goal for CY 1999. A corrugated cardboard shredder may be used for packaging and facilitating transportation of recyclable materials.	
Equipment Description:	This unit is a twin-rotor rip-and-tear shredder. The unit has a pinch conveyor. Feed conveyor has two safety plates that automatically stop the conveyor belt at 40 lb maximum pressure. Safety switches are located on both sides of conveyor. Heavy-duty fluid drive and wide-faced helical gears or heavy-duty drive clutches and double-chain drive are used.	
Implementation Requirements:	• Electrical service • Foundation	
Benefits:	• Enhance recycling revenues through efficient packaging and transportation of cardboard.	
Other Information:	None	
Procuring Activity Manager:	Mike Viggiano, Code 423 Naval Facilities Engineering Service Center Port Hueneme, CA	Tel: (805) 982-4895
Technical Activity POC:	Brian Swaidan, Code 423 Naval Facilities Engineering Service Center Port Hueneme, CA	Tel: (805) 982-1337
Vendor(s):	Excalibur Industrial Industrial Paper Shredders, Inc. Shred-Tech Limited	Model: TBD Model: TBD Model: TBD
Cost:	$48,000	

COMPETITIVE INITIATIVE
CLOSED-LOOP WASHRACK
GENERAL DESCRIPTION

P2 Opportunity: Contain and treat wastewater generated from the washing of aircraft, construction equipment, or vehicles before it is discharged. Wastewater typically contains detergents, fuel, oils, metals, and other contaminants. The specific equipment will vary by site application, but typical applications are upgrading inadequate oil/water separators that discharge wastewater to Publicly Owned Treatment Works (POTWs), replacing existing washrack equipment with closed-loop systems to recycle wash water, minimizing the need for utility water and detergents, and eliminating the requirement for water discharge permits.

Equipment Description: The typical closed-loop system consists of aboveground oil/water separators, coalescers, filters (oil/water, polishing, ultrafiltration (molecular), multimedia carbon, etc.), pumps, piping, and motors. Sites with fewer requirements may require only upgraded oil/water separators.

Implementation Requirements:

- Size: 2' wide x 4' long x 4' high to 5' wide x 10' long x 8' high
- Electrical: 220 VAC, 30 A, 1 phase
- Other requirements for closed-loop washrack system: Wastewater collection system (cleaning pad with drains) and sump pump

Benefits:

- Decrease need for utility water for closed-loop systems.
- Decrease need to procure new detergent for closed-loop systems.
- Save costs because of zero discharge of wastewater for closed-loop systems.

Other Information: This program upgrades existing washracks and installs closed-loop washrack equipment at sites where construction costs are minimal.

Procuring Activity Manager: Jill MacIntyre, 1.1.X.7.1.J.B — Tel: (908) 323-1936
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Lakehurst, NJ

Technical Activity POC: Joseph Cruz, 4.8.2.5 — Tel: (908) 323-2966

Vendor(s): TBD — Model: TBD

Cost: TBD

COMPETITIVE INITIATIVE
CUTTING FLUID RECYCLER
GENERAL DESCRIPTION

P2 Opportunity:	Reclaim cutting fluid used in machining operations. Permit reuse of cutting oils and coolants by removing suspended solids, tramp oils, and biological growth.
Equipment Description:	The cutting fluid recycler uses a centrifuge to remove contaminants. The unit includes pumps and hoses to permit fluid recycling directly from sump or tank. The unit is mounted on a cart with brakes to facilitate relocation of the recycler to various sites within the activity.

Implementation Requirements:

- Size: 60" long x 25" wide x 40" high
- Electrical: 230 VAC, 3 phase

Benefits:

- Reduce the need to procure new fluid.
- Save costs by reducing quantity of disposed waste fluids.

Procuring Activity Manager:	Jill MacIntyre, 1.1.X.7.1.J.B Naval Air Warfare Center, Aircraft Division Lakehurst, NJ	Tel: (908) 323-1936
Technical Activity POC:	Joseph Cruz, 4.8.2.5	Tel: (908) 323-2966
Vendor(s):	TBD	Model: TBD
Cost:	$25,000	

COMPETITIVE INITIATIVE
DRY FILTER PAINT BOOTH
GENERAL DESCRIPTION

P2 Opportunity: Reduces paint waste and eliminates the release of emissions into the atmosphere.

Equipment Description: The unit is a rectangular, corrosion-resistant, sheet metal booth that provides an environmentally safe area to paint equipment. The system uses forced airflow to filter out vapors and particulates. Particulate-laden air flowing towards the filter media is forced to rapidly change directions. The particulates, which have more inertia than the surrounding air, impact the filter media and are removed from the air flow. The scrubbed air is then vented into the atmosphere.

Implementation Requirements:

- Power requirements: 208 volts, 3 phase, 60 Hz
- Ventilation: Air ducting through the wall to the outside
- Dimensions: 18' wide x 8' high x 12' deep
- Airflow rate: Cross draft at 100 to 125 CFM
- Filter efficiency: 98% (must meet OSHA and NFPA 33 specifications)

Benefits:

- Provide an environmentally safe area to paint equipment.
- Reduce volatile emissions and particulates.
- Provide a healthier work environment.

Other Information: The vent ducts shall connect to the booth and go up and through the wall (or ceiling) to be vented into the air. Duct diameter is roughly 34 inches. Installation requirements will vary from site to site. The booth sections shall also be bolted to a level concrete floor. An air permit may be required to operate this booth.

Procuring Activity Manager: Jill MacIntyre, Code 1.1.X.7.1.J.B — Tel: (908) 323-1936
Naval Air Warfare Center, Aircraft Division
Lakehurst, NJ

Technical Activity POC: Michael Zitaglio, Code 4.8.1.6 — Tel: (908) 323-4284

Vendor(s): Grapek Company — Model: N/A

Cost: $21,921 (includes installation but installation costs may vary)

COMPETITIVE INITIATIVE
DRY FILTER PAINT BOOTH CONVERSION
GENERAL DESCRIPTION

P2 Opportunity: Substitutes dry filters for the water curtain used to remove particulates in paint booth overspray. This conversion eliminates the need for wastewater treatment and disposal. It also reduces overall paint booth operating and maintenance costs.

Equipment Description: Four types of dry filters are currently used: fiberglass cartridges, multilayer honeycombed paper rolls or pads, accordion-pleated paper sheets, and cloth rolls or pads. A metal framework is erected to replace the water curtain. Dry filter media is placed in the framework to remove airborne paint particulates. When the filter media is loaded, it is replaced with new, and the old is disposed of as solid waste.

Implementation Requirements:

- Secure electrical and water supply to water curtain pump
- Drain and dispose of water curtain reservoir
- Basic hand and electrical tools
- 8 to 16 hours for implementation

Benefits:

- Eliminate use of wastewater treatment chemicals.
- Improve collection efficiency.
- Reduce operating costs.
- Reduce maintenance costs by eliminating water pumping system.
- Eliminates water overflows and clean-ups.
- Eliminates removal or daily skimming of paint sludge from water reservoir.

Other Information: None

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Naval Facilities Engineering Service Center
Port Hueneme, CA

Technical Activity POC: Daniel Bojorquez, Code 423 — Tel: (805) 982-3425
Naval Facilities Engineering Service Center
Port Hueneme, CA

Vendor(s): Chemco Manufacturing Co., Inc. — Model: Quick Lock Track and High Solids II Media

Cost: $700 (Conversion kit hardware)
$1,500 (1 year filter media supply)
(The above costs are associated with the conversion of a 10' high x 14' wide paint booth)

COMPETITIVE INITIATIVE
ENGINE WASH CAPTURE SYSTEM
GENERAL DESCRIPTION

P2 Opportunity:	Capture, temporarily store, and transport the rinsate from aircraft engine washwater at Navy and Marine Corps land-based activities. The engine wash process requires the unit to capture the rinsate coming off of the engine from both the exhaust pipe and the drain holes in the engine nacelle. Washwater captured by the unit can then be transferred to the appropriate system for treatment or proper disposal.
Equipment Description:	The unit is a mobile trailer-mounted tank that contains all the necessary attachments and devices to effectively capture the engine wash rinsate.
Implementation Requirements:	The unit is fully portable, but the nature of the engine wash process necessitates development of unique adapters for each aircraft. The initial unit will be able to support the T56 engine installed in the P-3, C-130, and E/C-2 aircraft.

Benefits:

- Eliminate uncontained potentially hazardous wastewater from engine wash procedures.
- Provide healthier work environment.
- Reduce costly fines.

Other Information:	None	
Procuring Activity Manager:	Jill MacIntyre, 1.1.X.7.1.J.B Naval Air Warfare Center, Aircraft Division Lakehurst, NJ	Tel: (908) 323-1936
Technical Activity POC:	Jim Ambrosino, 4.8.2.5	Tel: (908) 323-7904
Vendor(s):	TBD	Model: TBD
Cost:	TBD	

COMPETITIVE INITIATIVE
FLUORESCENT TUBE DISPOSER
GENERAL DESCRIPTION

P2 Opportunity: Navy activities generate large quantities of fluorescent light tubes that must be disposed of as hazardous waste. The fluorescent tube disposer is a reliable, economical method to crush light tubes while capturing mercury vapors.

Equipment Description: The unit fits over a standard 55 gallon steel drum, which serves as a receptacle for the broken glass and waste metal parts from the discarded fluorescent light tubes. The disposer crushes the glass and captures the mercury gas in a disposable filter cartridge. Each cartridge holds mercury gas from up to 2,400 4' light tubes. A 55 gallon drum holds debris from up to 800 4' light tubes.

Implementation Requirements:

- 55 gallon drum
- Electrical: 115 VAC
- Ventilation area under cover
- Hazardous waste treatment permit may be required in some localities.

Benefits:

- Dispose of fluorescent tubes safely and economically.

Other Information: None

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Technical Activity POC: Brian Swaidan, Code 423
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Port Hueneme, CA
Tel: (805) 982-1337

Vendor(s): Dextrite, Inc.
Model: ULC-55FDA-E
LC-55FDA-E,
LC-500FA-E

Cost: $5,740

COMPETITIVE INITIATIVE
FUEL RECYCLER
GENERAL DESCRIPTION

P2 Opportunity:	Navy activities generate large quantities of waste oil, including used crankcase oil. The fuel recycler blends waste oil with diesel fuel to create a high-quality diesel fuel while eliminating used oil disposal costs and improving recycling revenues.	
Equipment Description:	The unit blends 1 part waste oil with 20 parts diesel fuel while removing water and solid contaminants. The unit incorporates a three-stage filter/separator technology, including separation, coalescing, and filtration. The resulting product is a high-quality fuel. Depending on the model, the unit can handle 3 to 5 gpm of used oil.	
Implementation Requirements:	The unit is available as a mobile self-contained system that can be moved from vehicle to vehicle or mounted on a flat-bed trailer. The unit should be located in a paved and bermed area. Electrical service is required.	
Benefits:	• Eliminate used oil disposal costs. • Increase recycling value of used oil.	
Procuring Activity Manager:	Michael Viggiano, Code 423 Naval Facilities Engineering Service Center Port Hueneme, CA	Tel: (805) 982-4895
Technical Activity POC:	Brian Swaidan, Code 423 Naval Facilities Engineering Service Center Port Hueneme, CA	Tel: (805) 982-1337
Vendor(s):	Parker Hannefin Corporation	Model: 800-5, 800-OF3, 800-OF6
	PALL Land and Marine	Model: TBD
	Farr Technologies	Model: TBD
Cost:	$2,000	

COMPETITIVE INITIATIVE
GAS ENGINE EMISSION ANALYZER
GENERAL DESCRIPTION

P2 Opportunity:	Reduce air emissions by allowing for improved maintenance on diesel engines.
Equipment Description:	The gas engine emission analyzer is an electronic system used to diagnose diesel engine performance problems, allowing for early warning and expedient repair. The unit consists of a digital oscilloscope and necessary accessories to perform full diagnosis of internal combustion engines.
Implementation Requirements:	The unit is portable and operates on either AC (115V) or DC (12V) power.
Benefits:	• Reduces air emissions by indicating need for timely maintenance on diesel engines.
Other Information:	Suitable for use in a garage environment.

Procuring Activity Manager:	Jill MacIntyre, 1.1.X.7.1.J.B Naval Air Warfare Center, Aircraft Division Lakehurst, NJ	Tel: (908) 323-1936
Technical Activity POC:	Jim Ambrosino, 4.8.2.5	Tel: (908) 323-7904
Vendor(s):	Snap-On Tools Corp.	Model: Counselor II
Cost:	$15,920	

COMPETITIVE INITIATIVE
GLASS RECYCLING CRUSHER
GENERAL DESCRIPTION

P2 Opportunity:	Per Executive Order 12873, DOD has established a 50% solid waste recycling goal for CY 1999. A glass recycling crusher may be used to compact recyclables for transport to market.	
Equipment Description:	The glass recycling crusher results in up to a 12-to-1 glass volume reduction and can hold nine cases of crushed 12 oz beverage bottles in one 10 gallon bucket. Model 1900 has a stainless steel exterior finish, weighs 180 pounds, and can process gallon glass containers as large as one gallon in capacity.	
Implementation Requirements:	• Electricity at 115 volts and 6.6 amps. Compact size.	
Benefits:	• Achieve 50% recycling goal. • Compact glass recyclables for efficient transport to market. • Realize revenues from sale of recyclables. • Avoid disposal costs.	
Other Information:	Unit is available in different models depending on the size and compaction efficiency required.	
Procuring Activity Manager:	Michael Viggiano, Code 423 Naval Facilities Engineering Service Center Port Hueneme, CA	Tel: (805) 982-4895
Technical Activity POC:	Brian Swaidan, Code 423 Naval Facilities Engineering Service Center Port Hueneme, CA	Tel: (805) 982-1337
Vendor(s):	Glass Recycling, Inc.	Model: 1900
Cost:	$4,850	

COMPETITIVE INITIATIVE
GLOVEBOX PLASTIC MEDIA BLASTER
GENERAL DESCRIPTION

P2 Opportunity:	Eliminate use of hazardous chemical solvents to remove paint and light corrosion from soft metal aircraft parts.	
Equipment Description:	The glovebox plastic media blaster is a direct-pressure, blast-cleaning cabinet with manually controlled nozzles through which plastic media fluidized with compressed air is projected. Paint and corrosion waste are separated, which allows the media to be reused.	
Implementation Requirements:	• Dimensions: 5' wide x 7' deep x 8' high • Electrical: 220V, 3 wire, 1 phase, 30 A • Compressed Air: 100 CFM at 100 psi minimum	
Benefits:	• Reduce labor hours for paint stripping operations. • Eliminate chemical use. • Provide healthier work environment. • Reduce toxicity of wastestream.	
Other Information:	None	
Procuring Activity Manager:	Jill MacIntyre, 1.1.X.7.1.J.B Naval Air Warfare Center, Aircraft Division Lakehurst, NJ	Tel: (908) 323-1936
Technical Activity POC:	Chris Mahendra, 4.8.2.5	Tel: (908) 323-7131
Vendor(s):	Abrasive Blast Systems, Inc.	Model: PRC-4848
Cost:	$6,342	

COMPETITIVE INITIATIVE
GLOVEBOX PLASTIC MEDIA BLASTER
TECHNICAL SPECIFICATION

The Abrasive Blast Systems Model PRC-4848 Glovebox Plastic Media Blaster is a stationary, direct pressure, blast cleaning cabinet with manually controlled devices for removing paint from metallic components by projecting plastic media fluidized with compressed air through a nozzle. Other media that may be used in the unit without modification include: steel shot (S230-S70), garnet (16-400 mesh size), aluminum oxide (200-400 mesh size), and glass bead (14-400 mesh size). The components may be fabricated from aluminum, magnesium, or steel alloy. This equipment is for use in airframe shops at shore-based intermediate maintenance activities. The unit has been designed to meet shipboard requirements; however, no units are being allocated for shipboard activities at this time.

Facility Interface Requirements:

Overall Dimensions: 5' 2" wide x 7' 3" deep x 8' 2" high; with track extension, width is 8'.
Power Requirements: 220 V, 3 wire, single phase, 60 Hz. 30 A circuit breaker is required.
Compressed Air Requirements: Minimum of 80 CFM at 80 psi. The unit shall be capable of regulating a pneumatic air supply pressure of 125 psig to an operating pressure of 15 to 100 psig.
Space Requirements: At the installation site, clearance from the front will be required for operator access and operation. Right side clearance is necessary for access to swing doors and for cartridge inspection. A minimum of 18" is required for rear clearance for access to piping manifold, exhauster, and screen hopper.
Other: All wiring and electrical controls shall be installed, with all connections completed within and on the unit so that, upon installation of the unit, all that is required is connection to a pneumatic supply and electric power source. Installation instructions shall be provided with the units.

Blast Media:

The glovebox plastic media blaster units shall be optimized for use with any sieve range of MIL-P-85891, Type V plastic media. MIL-P-85891, Type V, mesh size 20-400, is the plastic media that is ordinarily used in glovebox applications.

Applicable Documents:

MIL-P-85891, Plastic Media for Removal of Organic Coatings

Occupational Safety and Health Administration (OSHA) Safety and Health Standard 29 CFR 1910, 1910.1025

NEC Articles 250 and 300

Minimum Requirements:

Design and Construction: The equipment shall be designed for operating simplicity and safety to operating personnel and shall permit easy accessibility of components for normal maintenance and servicing. The unit shall consist of three sections, including the blast cabinet, media supply system, and recovery system. The unit shall be designed for use with plastic media—as opposed to other blast material.
Identification: Nameplate information shall contain the following:

a. Contract Number
b. Part Number: PRC-4848
c. CAGE: 62974
d. Manufacturer: Abrasive Blast Systems, Inc.
e. NSN
f. Serial Number
g. Type Equipment Code
h. Technical Manual Number

Safety: The glovebox plastic media blaster shall be equipped with OSHA door switches and other safety devices required by OSHA. Parts that are hazardous to the operator shall be guarded. All rotating elements shall be spark-proof. The noise level measured at the operator workstation when the unit is operating shall not exceed 80 db(A), in accordance with OSHA standards. Ventilation shall meet OSHA 1910 standards and shall allow the operator to clearly view the work piece during blasting.
Size: The maximum overall dimensions of the standard unit for shipboard use is: 5' wide x 8' deep x 8' high. With the turntable and track assembly option for shore-based units, the unit shall fit into an 8' wide x 8' deep x 8' high envelope.

0001 **Blast Enclosure**
This is defined as the blast cabinet in which blasting is performed and its supporting structure. The enclosure shall be free-standing and require no additional support. The supporting structure shall be sufficiently unobstructed below the glovebox to allow the operator to sit (if desired).

Minimum Requirements:

Glovebox: The glovebox shall be designed to enable the operator to work through the glove ports and manually direct the abrasive blast against the work piece while observing the blast action through the window. The glovebox shall contain a turntable that can be manually wheeled in and out of the glovebox on a dolly and track. The interior dimensions of the glovebox (+/- 2") shall be 36" deep x 48" wide x 48" high. The glovebox shall be constructed of carbon steel of no less than 14 gauge, with the glovebox floor being 3/16" thick perforated steel and having a 1,000 lb capacity for a distributed load. The glovebox sump shall be designed to ensure a continuous gravity flow of spent plastic media and debris into the return duct without the use of mechanical vibration. The outlet for the spent media and debris shall be large enough to prevent debris from obstructing the recovery system. The sump connection shall be sufficiently wide and short to allow the operator to clear debris from the sump outlet with one hand. Compressed air and blast hoses shall not interfere with the blasting operation.

Gloves: The glovebox shall be provided with cloth-lined gloves constructed of abrasive-resistant, anti-static material. Two working ports shall be provided through the front wall of the glovebox. The abrasive-resistant synthetic rubber gloves shall be secured along the edge of the ports.

Light Intensity: The glovebox shall be illuminated by three 150 watt lights located on the top center of the glovebox or towards the window. These lights shall be protected from the blasting. The lights shall be fluorescent.

Doors: The glovebox shall have one access door on each side adjacent to the operator work station. Access doors shall provide the maximum opening possible without impairing the structural integrity of the cabinet. Access doors shall exhibit no leakage during continuous operation of the cabinet.

Observation Window: The observation window shall be a shatterproof glass or plastic assembly not less than 1/8" thick. The window shall be sealed and mounted to absorb shock and resist leakage. Outside light reflections shall be minimized. The dimensions of the window are 12" high x 18" long.

0002 **Media Supply System**

The media feed pressure vessel shall be a direct pressure design. Mixing of the media shall occur in the blast air path before the blast hose. The media shall be introduced into the blast stream by passing from a pressurized media vessel through a media feed valve into the mixing chamber via gravity flow. The media feed capacity shall be a minimum of 5 lbs. The pressure vessel and blast air pressure shall be monitored by the same pressure gage. The media and compressed air mixture shall flow from the mixing chamber through the blast hose and venturi nozzle.

<u>Minimum Requirements:</u>

Blast System Control: The blast system shall be controlled by a foot pedal. Air shall be supplied to the foot pedal through flexible tubing/hose.

Air Pressure Regulator and Gage: The pressure regulator and gage shall be mounted in a readily accessible location on the front of the glovebox.

Blast Hose and Nozzle: The blast hose shall be designed to resist media abrasion and withstand working pressure. The hose shall be sufficiently flexible to withstand bending into a circle of 5.0" maximum radius. The nozzle and holder shall be manufactured from an erosion-resistant material. The unit shall come with tungsten carbide-lined nozzles of 3/8" and 5/16". The inside diameter of the hose and inlet inside diameter shall both be 1/2".

Magnetic Particle Separator: The magnetic particle separator shall capture greater than 99% by weight of all ferromagnetics in the feed stream. It shall be self-cleaning or be easily accessible so the operator can remove and clean it.

Blast Pressure Control: Blast pressure shall be adjustable and regulated from at least 15 to 70 psi. Blast pressure settings and performance shall be repeatable.

Media Supply Pressure Vessel: The media supply pressure vessel shall be a direct pressure design. The media shall flow evenly, without pulsing, from the pressure vessel during blasting. When the blasting stops, the pressure vessel shall automatically exhaust and refill with the reclaimed media.

0003 **Reclamation System**

The glovebox shall include a suitable exhauster and media reclaimer (cyclone) that shall separate usable media from dust. The term "dust" includes fine particles of sizes below the usable media and removed paint. The reclamation system shall be capable of adjustment to accommodate the recovery of fine, medium, or coarse abrasives. The reclamation system shall be at least 95% efficient—with no more than 5% of media discarded into the dust collector on each pass through the system. The reclamation system shall be sized to reclaim the media faster than it is supplied through the range of feed rates for which the unit is designed.

Minimum Requirements:

Dust Collector: The design shall include an exhaust and dust collector for maintaining a dust-free environment within the glovebox and shall meet the test requirements of section 5.3.2.8. The dust collector shall seal tightly to prevent leakage of the dust and shall provide a contaminant-free work atmosphere in accordance with OSHA 1910. Ventilation shall be a minimum of 599 CFM (12 air changes per minute).

Media Supply Hopper (Pressure Pot): A screen shall be installed above the hopper to retain debris larger than sieve size 8. The volume of the hopper shall be approximately equal to the volume of the pressure vessel. An access door shall be provided for removing the screen and debris.

Moisture Separator: A moisture separator shall be installed upstream of all pneumatically operated components. It shall be capable of removing a minimum of 95% of the condensate from the air supply.

Parts Cleaning: An air hose with nozzle for use in blowing media free from the work piece shall be furnished within the glovebox. The air hose shall be stored away from the blast area when not in use.

Pneumatic Vibrator: A pneumatic vibrator shall be installed on the bottom of the screen inside the storage hopper to prevent media build-up and to allow the media to fall freely to the bottom of the hopper.

COMPETITIVE INITIATIVE
GLYCOL RECYCLER (BATCH), 100 GALLONS
GENERAL DESCRIPTION

P2 Opportunity: Recycle used antifreeze from engine-driven pieces of equipment/vehicles. Minimize the quantity of spent antifreeze (glycol) that must be disposed of and the potential for spills. Used antifreeze may contain a variety of dissolved heavy metals such as lead, zinc, copper, and iron. Recycling this material reduces hazardous waste generation.

Equipment Description: The glycol recycler is a closed-loop system that refines used antifreeze and water mixtures with an additive to neutralize acids and replace inhibitors. The unit contains 5-micron filters and provides aeration for oxidation and removal of dissolved metals.

Implementation Requirements:

- Electric: 115V
- Capacity: 100 gallons
- Size: 52" long x 40" high x 37" deep

Benefits:

- Reduce requirement for procurement of new antifreeze.
- Eliminate disposal costs of used antifreeze.
- Provide a healthier work environment because a closed-loop system eliminates operator exposure to antifreeze.

Other Information: None

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Technical Activity POC: Walt Koehler, 4.8.1.4 — Tel: (908) 323-7907

Vendor(s): FPPF Chemical Co. Inc. — Model: ARS-100

Cost: $3,263

COMPETITIVE INITIATIVE
GLYCOL RECYCLER (BATCH), 100 GALLONS
TECHNICAL SPECIFICATION

The Glyclean unit manufactured by FPPF Company will be utilized to prevent the release of both ethylene and propylene glycol during maintenance, repairs, testing, and disposal of automotive engines at shore-based sites. The units shall be designed to meet expected EPA requirements under Section 58 FR 61146 of the U.S. Clean Water Act.

Facility Interface Requirements:

Overall Dimensions: Not to exceed 34" wide x 45" high
Power Requirements: 115 V, 60 Hz, single phase AC power. Unit shall draw less than 15 A operating under a full load.
Compressed Air Requirements: Minimum of 100 CFM at 100 psi
Other: The complete unit shall be mobile and supported on a single frame.

Environment:

The units will be used in areas exposed to marine environments, which is understood to mean changing ambient temperatures, high humidity in salt-laden atmospheres, and high incidence of conditions for electrolytic action of dissimilar metals. The unit shall be capable of being stored, operated, or exposed to temperatures ranging from 0° to 125° F and exposed to a relative humidity of up to 100% in rain and salt fog.

Safety:

To protect personnel against hazards and accidents, the unit shall incorporate the following minimum safeguards and protective features.

a. Exposed moving and rotating parts shall be covered by removable guards of expanded metal or similar serviceable material.

b. Exposed edges shall be generously rounded and made smooth to prevent cutting edges and sharp corners.

c. Pressurized components and systems shall be safeguarded against sudden and catastrophic rupture by:

   1. Pressure testing assemblies and components to 150% of anticipated operating pressure during construction

   2. Non-destructive testing of welds and joints

   3. Installation of pressure relief, safety devices, and monitoring controls.

Materials:

Materials used to construct the unit shall be of commercial quality and suitable for the intended application. Parts other than corrosion-resistant materials shall be protected against corrosion after fabrication with environmentally-sound chemicals, electrolytic process, plating, or suitable non-lead paints and enamels. Paints shall not be used where disassembly for maintenance or repair will reduce or eliminate the effectiveness of corrosion protection. Cadmium plating paints shall not be used for corrosion protection. Asbestos shall not be used.

Fasteners:

All screws exposed in final assembly shall be corrosion-resistant steel. The corrosion-resistant material shall be non-galling in the threaded application. All other external fasteners (such as bolts, nuts, pins, and screws) shall be of the same material being joined or supported or shall be cathodic to the materials being joined or supported. Sheet metal or self-tapping screws shall not be used.

System Assembly:

The unit shall be assembled using hardware and construction practices that prevent parts from working loose in service. The unit shall be capable of withstanding stresses, shock, vibration, and conditions incident to shipping, storage, and usage and shall provide maximum ease and safety of operation. All components shall be readily accessible for operation, maintenance, and repair. All loose parts and accessories shall be adequately attached or stored on the unit for transport.

Male flare connectors on equipment used to connect to other systems shall have seal caps attached to protect flare threads when not in use. Hoses shall have female SAE end connections and shall include plugs to prevent intrusion of debris during storage. The unit shall include safety devices to protect equipment and personnel from excessive pressure or hazards incident to operation. Gages, controls, and other instrumentation shall be provided to monitor all the unit's functions specified herein.

> **Antifreeze Recycling Rate:** Not more than 1 hour to recycle 55 gallons of used antifreeze or 1 lb of antifreeze per minute
> **Filtration of Antifreeze:** The unit shall filter out particulates and solids from antifreeze in accordance with ASTM D-4656, Prediluted Aqueous Ethylene Glycol Base Engine Coolant for Automobiles and Light-Duty Service, to prepare the sample for each test.
> **Acid Removal:** The unit shall produce recycled antifreeze with acidity levels as follows:
>> **Glycolic Acid:** 2000 ppm $\pm$ 100 ppm
>> **Formic Acid:** 300 ppm $\pm$ 20 ppm
>
> **Antifreeze Losses:** The unit shall not have losses more than 5% of the antifreeze recovered during normal operations of the equipment when tested.
> **Accessories:** The unit shall be delivered with all components necessary to perform the above functions. These accessories shall include all hoses, fittings, filters, elements, and valves with couplers for attaching to the ends of charging hoses. Chemicals required for a 6 month operation period shall also be delivered with each unit.

System Design:

The system shall include: storage tanks, electric motor(s), recycling process hoses, and other devices and controls necessary to perform the functions described earlier. The complete unit shall be supported on a single frame to permit the unit to be transported to locations within and around the garage area. The unit may have casters (if designed that way) or be stationary but able to be moved (if designed without casters).

The unit shall conform to National Electrical Manufacturers Association (NEMA) requirements. The electrical power cord shall be at least 10 feet long. The cord and plug shall be a grounded type with a ground fault interrupter. The apparatus shall be a grounded type. The apparatus and controls shall comply with safety standards of UL 508. The insulation resistance of the electrical circuit shall not be less than 1 megohm.

Structures to protect all protruding parts and connected accessories (such as valves, pressure sensors, sight glasses, and electrical terminals) from accidental damage during operation and transport shall be provided.

COMPETITIVE INITIATIVE
HALON 1301 RECYCLING UNIT
GENERAL DESCRIPTION

P2 Opportunity: Transfer halon 1301 from aircraft fire bottles into a storage vessel to eliminate venting halon 1301 to the atmosphere. This equipment is required to safely transfer the halon so that it can be sent in bulk to a reclamation site.

Equipment Description: The halon 1301 air-powered pump and independent filtration system safely removes halon 1301 (under pressure) from aircraft fire bottles. This combination of equipment allows for the immediate transfer of contaminated 1301 into a storage cylinder, where it can be filtered and cleaned independently when the cylinder is full. This unit can be upgraded to perform reclamation of halon 1301.

Implementation Requirements:

- Compressed Air or Nitrogen Source (For Pump Unit): 100 to 120 psi at 13 CFM
- Ventilation system
- Power: 120V, 4 A

Benefits:

- Replace existing system.
- Transfer halon more efficiently (99%) and effectively.
- Provide ability to filter halon independently while continuing to pump out cylinders.
- Provide fleet with a system capable of future growth to provide an organic reclamation capability.

Other Information: None

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Technical Activity POC:	Mike Zitaglio, 4.8.1.6	Tel: (908) 323-4284
Vendor(s):	Getz Manufacturing	Model: HR 1301, P/N 58940 IF 502, P/N 59058
Cost:	$8,333	

COMPETITIVE INITIATIVE
HALON 1301 RECYCLING UNIT
TECHNICAL SPECIFICATION

The Getz halon 1301 air-powered pump and independent filtration system is comprised of two pieces of equipment that will transfer and recycle halon 1301 from aircraft fire bottles for use by the Navy and Marine Corps. The combination of these two pieces of equipment shall allow for immediate transfer of contaminated halon 1301 into a storage cylinder, where it can be filtered and/or cleaned independently when the cylinder is full. The system shall contain an air-driven double acting pump, an air-cooled pump barrel, stainless steel check valves and springs, and a stainless steel barrel sleeve and piston. The independent filtration system must be capable of filtering large quantities of potentially contaminated halon 1301. The system must be able to operate and filter independently while the halon 1301 air-powered pump continues to recover halon 1301 in a separate recovery cylinder. Both units shall be designed to allow for future growth via add-on components for the purpose of reclaiming halon 1301 to industry standards.

0001 **Pump Unit**

<u>Facility Interface Requirements:</u>

Overall Dimensions: 36" long x 25" wide x 44" high (maximum)
Overall Weight: 150 lbs (maximum)
Air Requirements: Capable of operating on compressed air or nitrogen from 100 to 120 psi @ 13 CFM
Inlet Pressure: System must accept 0 to 1000 psi inlet pressure (cylinder discharge pressure)
Discharge Pressure: 400 psi for discharge to a storage/shipping container

<u>Minimum Requirements:</u>

Efficiency: Shall be capable of a 99% efficiency rating for transfer of liquid, vapor, and nitrogen and be capable of achieving a 15" Hg vacuum in the recovery cylinder
Filtration: Shall filter particulate matter (15 micron) and indicate moisture (10 ppm dry, 65 ppm wet)
Liquid/Vapor Transfer Rate: Shall be able to transfer liquid halon 1301 at an average rate of 16 lbs per minute and 2 lbs per minute for vapor
Gauges: 0 to 1500 psi inlet and discharge pressure gauges and a 0" to 30" Hg vacuum gauge
Hoses: Minimum inner diameter of 0.5"; minimum outer diameter of 0.75". Shall be flexible, rated to meet required pressures, contain corrosion-resistant fittings, and brass quick disconnect couplers (both male and female). Servicing hoses shall be at least 6 feet in length.
Fluid Compatibility: All hoses and liquid seals must be compatible with halon 1301.
Safety: Unit shall incorporate pressure relief valves for safety.

0002 **Filtration Unit**

Facility Interface Requirements:

Overall Dimensions: 26" long x 24" wide x 53" high (maximum)
Overall Weight: 150 lbs (maximum)
Power Requirements: 120 V, 4 A circuitry
Mobility: System frame and console shall be mobile with wheels at least 6" in diameter.
Other: A sight glass is required for use

Minimum Requirements:

Filter Capability: Shall be capable of filtering acid, wax, oil, sludge and discoloration. The unit shall also filter particulate matter (15 micron), indicate moisture (10 ppm dry, 65 ppm wet), and remove moisture to at least .001% by weight.
Gauges: Unit shall contain a 0 to 600 psi inlet pressure gauge and a 0 to 600 psi discharge pressure gauge.
Hoses: Minimum inner diameter of 0.5"; minimum outer diameter of 0.75". Shall be flexible, rated to meet required pressures, contain corrosion-resistant fittings, and brass quick disconnect couplers (both male and female). Servicing hoses shall be at least 6 feet in length.
Fluid Compatibility: All components shall be compatible with halon 1301.

COMPETITIVE INITIATIVE
HAZARDOUS MATERIAL STORAGE LOCKER
GENERAL DESCRIPTION

P2 Opportunity: Navy activities are implementing more efficient methods to manage their hazardous materials. These management methods reduce the quantity of hazardous waste generated. Hazardous material storage lockers are an integral part of an efficient management system.

Equipment Description: These units are welded steel, prefabricated storage buildings. Length is variable from 5' and up, depending on storage requirements. Lockers can be configured to store 55 gallon drums or smaller containers. The units include 2 to 4 hour fire-rated walls and sumps sized at up to 30% of the building storage capacity. A typical heavy-duty unit features three storage compartments, measures 22' long x 9' wide x 9' high, weighs 9,000 lbs empty (and has a maximum gross weight of 44,000 lbs), and contains an 830 gallon under-floor sump. The unit has explosion-proof vents and lights and water and dry chemical fire suppression systems.

Implementation Requirements:

- Locker should be placed on a paved and bermed surface in a secure area.
- In high wind areas, lockers should be anchored using tie-downs.
- Electrical and plumbing service may be required.

Benefits:

- Reduce hazardous waste through effective management of hazardous materials.
- Provide safe storage of hazardous materials

Other Information: None

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Vendor(s): Safety Storage, Inc. Model: 22N, 22FS

Cost: $30,000
$40,000 (includes air conditioner)

COMPETITIVE INITIATIVE
HIGH-PRESSURE WATER JET SYSTEM
GENERAL DESCRIPTION

P2 Opportunity: Minimize waste, reduce labor, and provide a safer way to remove paint, corrosion, and marine growth from underwater mines of various configurations. Replace the use of dry blast media (*e.g.*, garnet grit, glass beads, sand, black diamond) with ultra-high-pressure water.

Equipment Description: The high-pressure water jet system uses automated equipment to blast cylindrical mines, as well as equipment to manually blast and manipulate mines of spherical, cubical, and other shapes. The unit uses up to 36,000 UHP water blasting capabilities and has a closed-loop wastewater filtration system to separate waste matter from water, thereby decreasing the volume of waste to be disposed.

Implementation Requirements: The NELP prototype system required:

- Space requirements: 20' x 30' area for intensifier pump and filtration system; 30' x 30' area for operator controls and cleaning cell
- Electric: 460V, 150 A, 3 phase (for intensifier pump); 230V, 25 A, 3 phase (for closed-loop wastewater filtration system); 480V, 60 Hz, 3 phase (for clamshell cabinet)
- Water: 6 gpm at 40 psi, temperature of 70^{o}F

Benefits:

- Reduce labor for cleaning parts.
- Replace the use of dry blast media with water—thereby eliminating inventory costs and storage problems.
- Save costs in labor, materials, handling, and disposal of hazardous waste.
- Reduce quantity and toxicity of wastestream.
- Provide healthier work environment.
- Provide more operator control to prevent mine damage.
- Resolve EPA air quality concerns associated with dry blasting equipment by eliminating breathable dusts.

Other Information: The system is currently being prototyped at MOMAU Unit 11, Naval Weapons Station, Charleston, SC.

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Vendor(s): Abrasive Blast Systems (Prime)
Jet Edge (Subcontractor)

Cost: $317,008

COMPETITIVE INITIATIVE
HIGH-PRESSURE WATER JET SYSTEM
TECHNICAL SPECIFICATION

The high-pressure water jet system is designed to remove paint, corrosion, and marine growth from mines of various configurations. The system employs automated equipment for the blasting of cylindrical mines, and equipment for the manual blasting and manipulation of mines that are spherical, cubical, and other shapes. The unit uses high-pressure water in place of dry blast media, including garnet grit, walnut, glass beads, sand, and black diamond. The intent of the system is to remove the operator from the blast room for the majority of the blasting operations. Consequently, after setting up and positioning cylindrical mines, the blasting process will be controlled remotely from an operator work station. Mines of non-cylindrical geometry shall be blasted at the manual blasting station.

Facility Interface Requirements:

Space Requirements: 20' x 30' area for intensifier pump and wastewater filtration system; 30' x 30' area for operator controls and automated blasting enclosure; 12' x 12' area for manual blasting station. The automated blasting enclosure shall be designed to fit through a 8' x 10' doorway using a forklift.
Power Requirements: 460 V, 150 A, 3 phase power (for intensifier pump)
230 V, 25 A, 3 phase power (for closed-loop wastewater filtration system)
115 V, 1 phase, 60 cycle power (for submersible pump at manual blasting station)
Water Requirements: Water supply of 6 GPM @ 40 psi, temperature of approximately 70° F.

System Requirements:

The high-pressure water jet system shall be designed to accomplish the following (at a minimum):

- Effectively strip lead-based and nonlead-based paint, corrosion, and marine growth from underwater mines
- Capture waste material generated during blasting operations
- Separate solid waste from liquid waste
- Filter and recycle blast water
- Store recycled water for reuse

The system shall automate the stripping process for cylindrical mines, which make up the majority of the mines that are processed. The mines may be tapered at the ends. Lugs will be detachable and shall be cleaned using the manual blast unit. Geometry and dimensions of the underwater mines are as follows.

Cylindrical Mines: 55" to 132" long x 10 to 23-3/8" in diameter; weight from 500 to 2000 lbs
Spherical Mines: 34-1/4" in diameter; 580 lbs
Rectangular Mines: 40" long x 29 1/4" wide x 25" high; weight from 800 to 900 lbs

Turnkey System Components:
The high-pressure water jet system shall incorporate the following turnkey components:

- Enclosed automated blasting station
- High-pressure water jet blasting equipment
- Wastewater filtration system.

Applicable Documents:

Occupational Safety and Health Administration (OSHA) Safety and Health Standard, 29 CFR 1910, 1910.1025, 1919

EPA Title 40 CFR, Protection of the Environment

NEC Articles 250 and 300

NFPA 70, Safety Standard

NFPA 79, Electrical Standard for Industrial Machinery

UL Standard 508

San Diego County, California Air Pollution Control District (SDAPCD) Rules and Regulations

Minimum Requirements:

Design and Construction: The equipment shall be designed for simplicity of operation and safety to operating personnel and shall permit easy accessibility of components for normal maintenance and servicing.
Identification: Nameplate information shall contain the following:

a. Contract Number
b. Part Number
c. CAGE
d. Manufacturer

Safety: Parts that are hazardous to the operator shall be guarded. All rotating elements shall be spark-proof. Positive locks shall be used to retain the mine body during the blasting operations. Appropriate interlocks shall be incorporated into the system to prevent the inadvertent actuation of the blast equipment. The failure of any one lock shall not result in system failure. The pressure generator shall be ASME coded. Safety shutdown systems and an automatic water pressure safety bleed-down valve shall be incorporated in the intensifier pump.
Noise: The noise level measured at the operator workstation while the unit is operating shall not exceed 80 db(A), in accordance with OSHA standards.

Ventilation: Ventilation shall meet OSHA 1910 standards and shall allow the operator to clearly view the work piece during blasting.
Specific Characteristics: The system shall:

a. Not generate hazardous waste, as defined by EPA Title 40 CFR
b. Not emit vapors or fumes, as defined by the EPA Title 40 CFR
c. Meet all EPA requirements and the San Diego, California Air Pollution Control District (SDAPCD) Rules and Regulations
d. Not create hazards to the safety and health of the employees cleaning parts, as defined in Title 29 CFR 1910.

0001 **Operator Control Panel**
The control panel shall contain at least the following functions:

- Mine rotation on/off
- Traverse right/off/left
- Water on/off
- Manifold rotation on/off
- Part rotation speed and range of speeds
- Traverse speed
- Emergency stop button
- Controls on/off.

Indicator lamps located on the control panel shall indicate the status of the system as appropriate and alert the operator of unsafe conditions or conditions in which service is required (such as when filter media requires changing).

0002 **High Pressure Intensifier Pump**
The intensifier pump shall be capable of providing at least 36,000 psi continuous operating pressure and shall include a high-efficiency electric TEFC motor and electronically controlled dual intensifiers. The unit shall be skid-mounted and have a tubular exoskeleton frame with lifting eyes. All covers shall be constructed of heavy gauge sheet metal. The flow rate shall be approximately 4.0 GPM. All operating parameters shall be managed through a Programmed Logic Controller (PLC). The PLC and all electrical components shall be a NEMA 12 electrical enclosure.

0003 **High-Pressure Plumbing**
High-pressure plumbing shall include, at a minimum: gauges, on/off valve, tubing, flexible lines, and fittings as required. An ultra high-pressure hose shall be provided for use with the high-pressure intensifier pump. Hose length shall be at least 50 feet. The hoses shall be tested to withstand 150% of rated flow.

0004 **Automated Blasting Station**
The automated blasting station shall comprise all equipment used with and responsible for the automated blasting and manipulation of cylindrical mines. Specifically, this system shall be composed of the blast enclosure, supporting structure, and recovery system.

<u>Minimum Requirements:</u>

Blasting Rate: The blasting rate, or stripping rate, shall be a minimum of 120 square feet per hour for the surface area of the mines. This corresponds to 7 mines per 8 hour work day.
Recovery System: A sump and an automatic pump will be located in the floor of the blast enclosure. The water and waste residue shall be automatically pumped to the filtration system.
Low-Pressure Air Gun: An air blow-off gun shall be provided to remove debris and dry the mines following blasting. The air blow-off gun shall include a hose of sufficient length for drying the cylindrical mines of the dimensions specified.
System Operation: The automated blasting equipment shall be operated approximately as follows:

a. Select mine to be processed.
b. Manually adjust the turning wheel assembly to the diameter cylinder to be processed.
c. Set the length for the mine being processed.
d. Set the lance speed.
e. Set the turning wheel speed.
f. Select either "Outer Diameter Blast" or "Manual Blast"
g. Turn on Room Exhaust System.
h. Turn on cabinet lights.
i. Press "Door Open" button until door is completely open.
j. Lower mine onto cradle.
k. Press "Door Close" button to completely close door.
l. Press "Cycle Start" button.
m. When the cycle is complete, insert the manual blast gun into the cabinet to touch up areas on the mine as required.
n. Press "Door Open" button. Remove mine.

Blast Enclosure: This is defined as the blast cabinet in which blasting is performed and its supporting structure. The blast enclosure shall be designed to contain all liquid, solid, and airborne blast waste. Dimensions shall be approximately 25' 7" long x 78" deep x 87" high. With the clamshell door open, the depth shall be approximately 85", and the height to top of door shall be approximately 128". The blast enclosure shall incorporate a clam-shell type design to allow cylindrical mines to be lowered into it from the overhead beam system of the facility. It shall be double walled and contain sound-dampening and corrosion-proof material. The viewing window(s) shall be as large as possible while still maintaining the structural integrity. The blast enclosure shall incorporate a water level shutoff feature in the event of high or low water conditions. Access doors shall be provided for loading and unloading the mines.

> **Inside Work Area:** Dimensions shall be approximately 4' deep x 16' long. The work area shall be lined with a replaceable rubber curtain for interior sound insulation.
> **Viewing Window:** The blast enclosure shall contain at least four viewing windows, measuring approximately 14" x 19" each. Two windows shall be located

to allow the operator to view the ends of the mine, and two windows shall be in the middle.

Lighting: Light shall be provided by incandescent lights mounted in the ceiling of the blast enclosure.

Drive Rollers and Cradle Rollers: Mines shall be placed on rollers, which shall cradle the cylinder at 45° each. One set of rollers shall be fixed and act as drive rollers. The weight of the mine on the rollers shall cause it to roll with the drive roller motion. The drive rollers shall be mounted using sealed bearings and billow blocks to support the load. The drive roll shall be operated by a gearbox and a variable speed motor. The second set of cradle rollers will be mounted to slides and will be adjustable in order to maintain a 45° angle in relation to the mine being cleaned. The operator can adjust the cradle roller by rotating one crank handle. The failure of a single roller shall not disable the entire system.

Framework: All components will be mounted on a tubular steel frame, which shall be primed and painted. The main framework will be rectangular in shape with an upright housing on opposing ends. The uprights on each ends will house the drives—with one upright housing the roll drive and the other housing the traverse drive.

Cleaning Head Assembly: The cleaning head assembly shall traverse between the two drive housings linearly. The traverse speed—as well as the drive roll speed—shall be manually set by the operator. The operator will have to change the setting on an electronic speed pot to increase or decrease feed or rotation speed. Cleaning head stand-off will be manually adjusted by means of a hand crank and a slide assembly. The total z axis movement will be at least 12 inches. The cleaning head shall also be adjustable in the horizontal plane because the drive roller on the cradle system remains fixed, which changes the centerline of the cylindrical mine. All cleaning head adjustments shall be performed manually by the operator.

Rotary Cleaning Head: The blasting shall be performed by a dual head, multi-orifice rotating manifold. A pneumatically-driven variable motor will power the rotary cleaning head. The maximum rotational speed of the assembly will be 1500 rpm. A vacuum shroud will surround the rotary manifold.

Primary Settling Tank: All paint, corrosion, and marine growth removed will be captured by the vacuum and sent to a primary settling tank. The wastewater will be transferred by a pump from the settling tank to the closed loop wastewater filtration system.

Manual Blast Gun: A manual blast gun shall be provided for touching up the mines once the automated blasting cycle is complete. The design shall allow for the manual blast gun to maneuver sufficiently for the operator to clean the ends of the cylindrical mines for the dimensions specified.

0005 **Closed Loop Wastewater Filtration System**

The system shall be designed to accomplish at least the following:

1. Physically separate waste comprised of lead-based and nonlead-based paint, corrosion, and marine growth into solid and liquid waste
2. Neutralize lead-based paint waste
3. Filter and recycle the water used during blasting.

The wastewater filtration system shall not involve ground excavation. The system shall be located in such a way that the sludge can be emptied into a 55-gallon drum via gravity. The system shall comprise the following components.

Minimum Requirements:

Primary Separation: Wastewater shall enter the system by means of a cyclonic separator, which uses the centrifugal force created by the incoming feed stream to remove heavy particles. The cleaned water shall exit the separator as overflow, and the solids shall settle into the lower cone and be discharged via a manual gate valve. Moisture content of the sludge shall not exceed 30%.

Settling Tanks: Overflow water exiting the cyclonic separator shall go to two settling tanks. The initial settling tank shall permit settling of solids, which can be periodically removed via a manual gate valve. The clarified liquid shall now flow into the secondary settling tank. The bottom of this tank shall incline towards the discharge line, and solids can be periodically removed via the manual gate valve as described earlier. A float-activated submersible pump shall be positioned above the bottom of this tank on a removable screen. This pump shall be used to drive the water into the first filtration device. The pump will not operate when the water level drops below the intake level. A high water control (float switch) shall prevent overfilling of the settling tank. Moisture content of the sludge discharging from the gate valve shall not exceed 30%.

Bag Filter Array: An array of five bag filters shall be used to remove particles 20 microns in size or greater. A float-activated submersible pump is used to pump the filtered water into the pressurized sections of the system.

Diatomaceous Earth Filter Elements: The diatomaceous earth (DE) filter elements will provide 1 micron filtration of particulates, as well as removal of free oil and grease components contained in the water. The filter elements shall provide at least 144 square feet of filter area. The DE filter is equipped with a backflush valve to remove solids when the filter elements become fouled.

Carbon-Bonded Ceramic Media Filtration: A carbon-bonded ceramic media filtration device shall be used to remove lead and other heavy metals contained in the water. The filter bed shall contain 8 cubic feet (240 lbs) of the media. The total absorption capacity of the filter shall be 2.4 lbs lead or other heavy metals.

Carbon Filtration: A granular activated carbon filter bed shall be used to filter organics, chlorinated compounds, and any chemicals not filtered in the carbon-bonded ceramic media filter bed. The filter bed shall be approximately 8 cubic feet (224 lbs).

Water Recycling: Treated water shall be pressurized to 85 psi and stored in a pressure tank for reuse in blasting operations.

0006 **Manual Blasting Station**

The manual blasting station shall enable operators to blast mines of non-cylindrical geometries (i.e., spherical, cubical, etc.) while still utilizing the water jet blaster and wastewater filtration system. This station shall allow the mines to be suspended from the facility's overhead beam assembly during the blasting process.

Minimum Requirements:

Sump and Containment Area: The sump shall comprise a spill containment system measuring 10' x 10' x 1'. A submersible pump and 75' of hose with a 2" diameter shall send the wastewater to the closed-loop wastewater filtration system. The submersible pump shall empty the containment area sufficiently to permit no more than 1/8" depth of standing water to remain.

Hose and Connections: The hose provided with the submersible pump has 2" NPT discharge. The inlet for the closed-loop wastewater filtration system also has a 2" threaded pipe connection.

COMPETITIVE INITIATIVE
HIGH-VOLUME LOW-PRESSURE PAINT SPRAY GUN
GENERAL DESCRIPTION

P2 Opportunity: Conventional paint spray guns operate at high pressures, which results in waste because of overspray. High-volume low-pressure (HVLP) paint spray guns reduce paint waste by maximizing the amount of paint covering the intended surface and minimizing overspray.

Equipment Description: The HVLP spray gun is made of aluminum, hand-operated, and has a 1/4" air inlet. It comes with an 8 oz. cup. This particular paint gun is intended for detail painting.

Implementation Requirements:

- The spray guns must be used in conjunction with an air-operated paint system.
- Air compressor and hoses

Benefits:

- Reduce paint waste because of reduced overspray.

Other Information: Paint gun designs vary depending on whether they are used for general spraying or detail work.

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Vendor(s): Fluid Air Products Model: EGHV600

Cost: $400 - $800 (depending on capacity)

COMPETITIVE INITIATIVE
HORIZONTAL BALER
GENERAL DESCRIPTION

P2 Opportunity: Per Executive Order 12873, DOD has established a 50% solid waste recycling goal for CY 1999. A horizontal baler is used to compact recyclables for transport to market.

Equipment Description: The horizontal baler can process 75 to 100 tons of recyclables, including paper, plastic, and metals. The baler system includes an inclined conveyor to feed materials into the top opening of the baler.

Implementation Requirements:

- Electricity and foundation
- Conveyor for efficient operation

Benefits:

- Achieve 50% recycling goal.
- Compact recyclables for efficient transport to market.
- Realize revenues from sale of recyclables.
- Avoid disposal costs.

Other Information: Horizontal balers are available in different models depending on bale size and compaction efficiency.

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Vendor(s): International Baler Corporation Model: IB-4440

Cost: $161,890

COMPETITIVE INITIATIVE
HYDRAULIC PURIFIER
GENERAL DESCRIPTION

P2 Opportunity: Extend the use of aircraft hydraulic fluids, MIL-H-46170 and MIL-H-83282, applicable to aircraft and ground support equipment.

Equipment Description: The Hydraulics International, Inc. fluid purifier is a small, portable, electrically powered, ground support system designed to maintain fluid cleanliness. It removes particulate, water, air, and chlorinated solvent contamination using 3-micron absolute filters, water adsorption filters, air desiccant filters, and a low vacuum. The purifier does not alter the physical or chemical properties of the reconditioned fluid. The unit is mounted on four casters with wheel brakes to facilitate moving for maintenance. Unit is supplied with a Class “L” MS90556-type straight plug connector.

Implementation Requirements:

- Electrical: 220/440V, 60 Hz , 3 phase
- Size: 29" long x 43" high x 34" wide, 400 lb dry
- Maximum Flow Rate: 5 gpm
- Inlet Port: Aeroquip quick disconnect, P/N TA155-S4-16D
- Outlet Port: Aeroquip quick disconnect, P/N TA155-S4-20D

Benefits:

- Reduce quantity and cost of fluid disposal.
- Reduce procurement of new fluid.

Other Information:

- Unit is a general fluid reconditioner with potential applications for fluids other than MIL-H-46170 and MIL-H-83282.
- Adapters may have to be modified to allow the purifier to connect with other fluid systems.

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Vendor(s): Hydraulics International, Inc. — Model: HPU-1-5

Cost: $7,922

COMPETITIVE INITIATIVE
HYDRAULIC PURIFIER
TECHNICAL SPECIFICATION

The Hydraulics International Purifier Model HPU-1-5 system is designed to recondition contaminated hydraulic fluid by removing particulates, free/dissolved water, and chlorinated solvents to levels permissible for aircraft and support equipment. Use of this multiple-pass purifier will permit Navy intermediate aviation maintenance activities (AIMDs) to purify and reuse contaminated hydraulic fluid within support equipment. This then reduces the need to procure new hydraulic fluid and allows oil to be reused instead of disposed as hazardous material. This caster-mounted unit can operate as a stand-alone unit for support equipment and hydraulic fluid in containers or in conjunction with portable hydraulic test stands for aircraft hydraulic systems.

Facility Interface Requirements:

Overall Dimensions: 32" long x 28" wide x 50" high
Power Requirements: 220/440 VAC, 50/60 Hz
Other: The unit is mobile and mounted on casters.

Minimum Requirements:

Weight: 375 lbs (dry weight)
Fluid Compatibility: MIL-H-46170 and MIL-H-83282 as a minimim
Contamination Removal Rate: Decontaminate 50 gallons per hour
Contamination Removal Capabilities: Remove various contaminants to the level listed below without removing additives or degrading performance of the fluid.

- **Particulate Contamination:** The unit employs a 3 micron absolute filter to remove particulate matter to a cleanliness level of at least Navy Standard Class 3 or NAS 1638 Class 3.
- **Water Contamination:** 100% removal of free and entrained water and reduce dissolved water concentration to 250 parts per million (ppm).
- **Chlorinated Solvent Contamination:** Reduce the concentration of chlorinated solvents to 100 ppm or less.

Flowrate: 5 GPM (maximum)
Pressure: Adjustable pressure 0 to 300 PSIG
Mobility: Unit is mounted on four 6" diameter casters to allow the operator to move the unit with a push-pull handle. This unit has a minimum ground clearance of at least 3" and has manually operated parking brakes.
Port Fittings: The following quick disconnect fittings are mounted on the unit to reduce leakage and ease hose installation.

- **Discharge Fitting:** Aeroquip Corp. P/N .TA155-S4-16D or equivalent
- **Intake Fitting:** Aeroquip Corp. P/N .B145-S4-20D or equivalent

Hose Assembly: The length of the intake and discharge hoses is 10' each. The end fittings for both ends of the discharge hose shall be Aeroquip Corp. Part No. 145-S5-20D quick disconnect fittings or equivalent. The ends of the intake hose shall have Aeroquip Corp.

Part No. 155-S5-16D fittings or equivalent. Internal hose assemblies only use Teflon (PFTE) hose.

Dustcaps: All hydraulic hose end and port fittings shall be provided with dustcaps to minimize contamination during storage. The dustcaps shall be firmly secured by chain or wire to or near the appropriate fitting to prevent loss of dustcap.

Hazardous Materials: Operation of purifier will not require use of hazardous or environmentally unacceptable material as defined under FED-STD-313, ozone depleting substances (ODS) in Title VI of the Clean Air Act, or hazardous air pollutants in Title I, Part A of the Clean Air Act. In addition, provisions for the containment of hazardous or environmentally unacceptable materials, ODS, or pollutants discharged by the fluid purification process are required.

Note: The design of the purifier is for the maintenance of aircraft hydraulic systems that are sensitive to particulate, chlorinated solvent, and water (free, entrained and dissolved) contamination. If the requirement of your activity is to remove large particulate material (i.e., metal shaving, visible dirt) and/or free water, less expensive systems are available for this purpose.

COMPETITIVE INITIATIVE
IMPULSE PARTS WASHER
GENERAL DESCRIPTION

P2 Opportunity: Minimize waste and reduce time required to manually clean small soiled parts that would ordinarily require hand detailing.

Equipment Description: The impulse parts washer is a cleaning cabinet with spray nozzles (positioned along the interior walls and ceiling) and an external brush pump that blasts an environmentally safe detergent dissolved in an aqueous solution onto soiled parts. The system is entirely closed-loop, with no water discharge. The combination of high temperatures and strong blast pressure facilitates contaminant removal.

Implementation Requirements:

- Size: 38" wide x 24" deep x 49" high
- Electric: 220V, 60 Hz, 1 phase, 59 A
- Water: Standard pressure (<125 psi) water line to replenish water supply due to evaporation

Benefits:

- Reduce labor for cleaning parts.
- Replace the use of a hazardous solvent with a biodegradable solvent.
- Save costs in labor, materials, handling, and disposal of hazardous waste.
- Reduce the quantity and toxicity of the wastestream.
- Provide a healthier work environment.

Other Information: None

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Vendor(s): Better Engineering Manufacturing Company — Model: T-4500 Impulse

Cost: $5,300

COMPETITIVE INITIATIVE
IMPULSE PARTS WASHER
TECHNICAL SPECIFICATION

A system "equal to" Better Engineering Impulse Jet Washer shall be a cleaning cabinet with spray nozzles along the interior walls and ceiling that will blast an environmentally safe detergent in an aqueous solution onto critical soiled parts that would ordinarily require hand detailing. The system shall be entirely closed-loop, with no water discharge. The combination of high temperature and strong blast pressure enables the washers to remove the contaminants from the parts. The unit shall incorporate the features described below.

Facility Interface Requirements:

Overall Dimensions: 38" wide x 24" deep x 49" high
Power Requirements: 220 V, 1 phase, 60 Hz, 24 A
Water Requirements: Standard pressure water line, to replenish water supply due to evaporation.
Other: Installation drawings and instructions shall be provided with the units.

Minimum Requirements:

Work Area: 24" x 17" deep x 12" high
Weight Capacity: 150 lbs
Weight (Empty): 450 lbs
Tank Capacity: 20 gallon main tank
Insulation: Minimum one-inch polystyrene layer for heat retention during operation.
Controls: Adjustable thermostat
Pump Motor: 1.0 horsepower, with output of 20 GPM @ 30 psi
Brush Pump: The brush pump is a 4' long hose with a brush on the end through which the solution is pumped for use in manual cleaning. It is constructed of stainless steel.
Blast Pressure: Blast pressure shall be 30 psi.
Ventilation: Automatic venting of water vapor created during operation to the outside. Six-inch steam exhaust vent provided.
Cycle Temperature Requirements: The parts washer shall utilize an electric heat source capable of maintaining a water temperature of 180°F when run in the automatic mode. The unit shall be capable of heating the solution to 200°F +/- 5 degrees within 2 hours. For cleaning with the brush pump, detergent temperature is typically 120 - 160°F. The temperature shall be adjustable, and the parts washer shall be equipped with a water temperature gauge.
Heating System: Electric heat source, 4.5 kW
Electronics: The parts washer shall have electronic devices and controls that are silicon gasketed and sealed throughout so they are watertight. The unit shall be in compliance with NFPA Electrical Standard for Industrial Machinery.
Displays: Shall be rotary dials rather than LED type

Optional Features Included with Each Unit:

0001 **Detergent**

Giant Cleaning Systems powder detergent Natural Orange NAT-50 shall display the following characteristics. An amount suitable for at least 1,000 hours of operation shall be provided.

- The detergent is intended for use in power washers/spray cabinets for removal of oily contaminants.
- The concentrated detergent shall have no adverse effect on the health of personnel when used for its intended purpose.
- Surface active agents used in the cleaning compound shall be at least 90% biodegradable.
- The detergent should be alkaline, low-foaming, and contain a rust inhibitor.
- A titration kit shall be supplied with the detergent in order to check that the detergent meets manufacturer's recommended concentration. The manufacturer shall provide the following information:

    1. Certification stating that the material contains no carcinogens, heavy metals, total toxic organics, volatile organic compounds, or hazardous air pollutants.

    2. Material safety data sheets

    3. Certification stating that no change shall be made to the product formulation without notifying the Navy activity to which the product has been shipped.

The following identification marking shall appear in 2" high bold black lettering on each product container:

PARTS WASHER/SPRAY CABINET CLEANER
TYPE I WATER BASED CLEANER CONCENTRATE

The following warning shall appear on each product container:

Do not use at full strength (dilute to recommended concentration). Use at recommended temperature.

COMPETITIVE INITIATIVE
INFRARED CAMERA LEAK DETECTOR
GENERAL DESCRIPTION

P2 Opportunity: Locate harbor oil spills efficiently and consistently. Save laboratory chemical testing costs. Identify sources and types of spills.

Equipment Description: This leak detection system locates and defines petroleum product leaks in a harbor environment. A typical system allows information to be recorded on either video tape or floppy disk. The date and time of the image captured are accurately recorded. The unit is portable and operates similar to a camcorder. The camera records temperature and emissivity data used to identify and define oil spills.

Implementation Requirements:

- No electrical hook-up. Unit is portable and has a battery pack charging mechanism.
- The unit may also be mounted, but proper environmental protection is required.

Benefits:

- Reduce chemical testing required to locate spills.
- Reduce the amount of petroleum products in harbors by quickly identifying the source of discharge and determining accountability.

Other Information: Unit may be operated at night because of its infrared capabilities. Unit is able to handle vibrations such as those on board ships or small boats.

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Vendor(s):	TBD	Model: TBD
Cost:	TBD	

COMPETITIVE INITIATIVE
METALS PRECRUSHER
GENERAL DESCRIPTION

P2 Opportunity: Per Executive Order 12873, DOD has established a 50% solid waste recycling goal for CY 1999. A metals precrusher is used to compact discarded steel office furniture and other metals to enhance recycling revenues.

Equipment Description: The precrusher is a floor-mounted, stationary unit weighing 12 tons. The unit is 21' long x 9' wide x 5' high. The vertical gate protrusion at one end is 10' high. The hydraulic system is powered by a 30-hp electric motor. The unit delivers 96,000 lbs of compaction force and has a charge box capacity of 4.2 cubic yards. The unit features a weatherproof enclosure for outdoor installation. Baler can be operated outside in temperate climates.

Implementation Requirements:

- Foundation
- Vertical clearance: 10'
- Electrical: 220 VAC
- Single operator
- Baler can be located outside in temperate climates.

Benefits:

- Achieve 50% recycling goal.
- Compact metal recyclables for efficient transport to market.
- Enhance revenues from sale of recyclables.
- Avoid disposal costs.

Other Information: None

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Vendor(s): Galbreath, Inc. Model: APC 526

Cost: $40,400

COMPETITIVE INITIATIVE
MICRO-ABRASIVE BLAST SYSTEM
GENERAL DESCRIPTION

P2 Opportunity: Reduce toxicity of radiologically contaminated lead-based paint from submarine hulls, thereby allowing the waste to be classified as nonhazardous.

Equipment Description: The unit is a small, wet-abrasive blast machine with a nozzle that is used for deburring, cleaning, cutting, or drilling. A silicate-based substance is added to the blast media to inhibit the leaching of heavy metals by creating an insoluble silicate salt. A variety of different abrasives can be used depending on the application.

Implementation Requirements:

- Size: 17" high x 18" wide x 6" deep
- Electric: 115-220 VAC, 50-60 Hz, <100 W
- Air: 90 to 160 psi dry air. Air quality dryness to -100^{o}F dewpoint
- Other: A containment area must be set up in to use this equipment.

Benefits:

- Reduce labor for paint removal.
- Save costs in labor, materials, handling, and disposal of hazardous waste.
- Reduce quantity and toxicity of wastestream. Waste is classified as nonhazardous in accordance with EPA regulations.
- Provide a healthier work environment.

Other Information: None

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Vendor(s): Comco, Inc. — Model: MB-1005

Cost: $5,000

COMPETITIVE INITIATIVE
MICRO-ABRASIVE BLAST SYSTEM
TECHNICAL SPECIFICATION

A unit equal to the Micro-Abrasive Blast System shall be a small wet abrasive blast machine, which delivers a precisely controlled stream of abrasive particles in dry air at high velocity for use in deburring, cleaning, cutting, or drilling. The unit is a single-tank machine consisting of an inlet air valve, pressure regulating valve, pressure gage, pressure modulator, abrasive powder tank, mixing chamber, abrasive binch valve, and four nozzles. It is specifically used for the removal and detoxification of lead-based paint from submarine hulls. A silicate-based substance is added to the blast media to inhibit the leaching of heavy metals by creating an insoluble silicate salt. A variety of different abrasives can be used, depending on the application.

0001 **The Comco Micro-Abrasive Blast Unit, P/N MB1005-1**

Minimum Requirements:

Overall Dimensions: 17" long x 18" wide x 16" high (maximum)
Weight: 34 lbs (empty)
Power Requirements: 115 VAC, 50-60 Hz, 40 watts required
Inlet Air Pressure: 90 to 160 psi
Operating Pressure: 5 to 160 psi
Air Quality: Dryness to -100^{o}F dew point. (Equivalent to <100 ppm water vapor and < 10 ppm oil content).
Abrasive: 50µ glass bead, 2 bottles included with unit.
Powder Capacity: 200 in.^{3}
Air Volume: Required volume at 160 psi with an .080" nozzle is 4.0 SCFM
Nozzle Sizes: Four nozzles are included with unit.
- **Round:** 0.030" to 0.080" in diameter
- **Rectangular:** 0.008" x 0.125" or larger

0002 **The Comco Desiccant Air Dryer, P/N AD5100-4**
This item contains both pre-water and oil filters and weighs 18 lbs.

0003 **The Comco Replacement Desiccant Charge, P/N ST6104-2**
This item is a can of desiccant to replace the spent drying agent used in the air dryer.

COMPETITIVE INITIATIVE
OIL FILTER CRUSHER
GENERAL DESCRIPTION

P2 Opportunity:	Navy activities typically dispose of used oil filters as hazardous waste. Filter crushers may be used to compact the filters, thereby removing the waste oil. The waste oil is recycled, and the carcass is disposed of as solid waste. In some cases, the carcass may be sold as scrap.
Equipment Description:	Several different units are available through GSA. Units are typically positioned on a stand or in an enclosure. Units vary according to crushing force, size and number of filters crushed, percent of oil recovery, and cycle time. Units may be air- or electrically-driven.

Implementation Requirements:

- Depending on the selected unit, electrical and/or compressed air service
- Drum or container to capture waste oil
- Concrete foundation on which to bolt unit

Benefits:

- Recycle oil waste from filter.
- Dispose of crushed filter as solid waste instead of hazardous waste.
- In some cases, sell filter carcasses as scrap metal.
- Save storage space (important shipboard consideration).

Other Information:	None	
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Vendor(s):	Gray Automotive Products Company	Model: TBD
	McNeil Corporation	Model: TBD
	M-Tal Distributors, Inc.	Model: TBD
	Oberg International, Inc.	Model: TBD
	Sensitive Environmental Systems Corp.	Model: TBD
	Tire Service Equipment	Model: TBD
Cost:	$700 - $5,000	

COMPETITIVE INITIATIVE
OXYGEN COMPONENT ULTRASONIC CLEANING SYSTEM
GENERAL DESCRIPTION

P2 Opportunity: Eliminate the use of ozone-depleting substances (ODS) (CFC-113) to clean oxygen system components.

Equipment Description: The system consists of two heated ultrasonic tanks—one for cleaning and one for rinsing oxygen system components. The cleaning solution is comprised of 50% Naval Oxygen Cleaner (NOC) compound and 50% demineralized water. The rinsing solution is 100% demineralized water.

Implementation Requirements:

- Electrical: 220 VAC, 50/60 Hz, single phase (land-based); 440 VAC, 60 Hz, 3 phase (ship-board)
- Size: 36" long x 24" wide x 32" high
- Tank size: 11" long x 22" wide x 20" high

Benefits:

- Eliminate use of ODS.
- Remove organic and particulate contamination (oxygen system fire hazards) safely.
- Provide a healthier work environment.

Other Information: None

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Vendor(s): CAE Blackstone — Model: AQ-2-1122-S

Cost: $5,800

COMPETITIVE INITIATIVE
OXYGEN COMPONENT ULTRASONIC CLEANING SYSTEM
TECHNICAL SPECIFICATION

This specification defines the technical, interface, and testing requirements for an oxygen component ultrasonic cleaning system hereafter called system to support the present requirements for cleaning and rinsing naval aircraft support equipment (SE) oxygen components, naval aircraft oxygen cleaned components, and naval aviators' oxygen cleaned breathing components. The objectives of the system are (1) to apply the cleaning agent Navy Oxygen Cleaner (NOC) to remove thin soil films and particulate by submersion of oxygen components in a heated ultrasonic bath, and (2) to rinse oxygen components with heated demineralized water to remove NOC by submersion in an ultrasonic bath. It is not the intent of this system to remove large quantities of soil or contamination. The unit will be used at both Navy/Marine shipboard and landbased intermediate maintenance activities (IMA), and training centers.

Facility Interface Requirements:

Overall Dimensions: 36" l x 24" w. The system shall be capable of fitting through a doorway 26 inches wide by 66 inches tall.
Power Requirements: 110 VAC $\pm$10% at 50/60 Hz. Operation of the system shall not be dependent upon external pressurized air, vacuum service or consumable power sources (e.g., batteries, air cylinders).

Applicable Documents:

The following documents of the issue in effect on the date of the invitation for bids, form a part of the performance specification to the extent specified herein. In case of conflict between the requirements of any specification listed herein and the performance specification, the performance specification shall govern.

Military Standards:

MIL-STD-461	Control of Electromagnetic Interference Emissions and Susceptibility, Requirements For
MIL-STD-462	Electromagnetic Interference Characteristics, Measurement of
MIL-STD-810	Environmental Test Methods and Engineering Guidelines

Federal Standards:

49 CFR 173.2	Code of Federal Regulations, Transportation, "Hazardous materials classes and index to hazard class definitions"
29 CFR 1910.1200	Code of Federal Regulations, Labor, "Hazard Communication"

40 CFR 261	Code of Federal Regulations, Protection of the Subparts A, B, C, and D Environment, “Identification and Listing of Hazardous Materials”
40 CFR 82	Code of Federal Regulations, Protection of the Environment, “Protection of the Stratospheric Ozone,” Subpart A
Clean Air Act	Clean Air Act, Chapter 85, Subchapter I - 7412, “Hazardous Air Pollutants”
Federal Standard No. 313	Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities

Requirements:

The system shall be either bench-mounted or a console unit. The system will consist of two separate tanks, a cleaning tank and a rinsing tank.

Cleaning Tank Requirements: The cleaning tank shall be an ultrasonic tank which meets the following technical and physical requirements:

a. The tank shall operate within a generator frequency range of 25 to 40 kHz.

b. The tank shall have a self-regulated heated bath capable of submerging the oxygen components to be cleaned. The bath shall be capable of being heated to and maintaining a temperature of at least 140°F and not more than 170°F. The tank shall be capable of reaching 140°F within 45 minutes of turning the heating unit(s) on.

c. The tank shall be capable of submerging oxygen components with a minimum size of 0.125 in. in diameter (e.g., a small screw head) and a maximum size of 10 in. x 21.25 in. x 14.25 in..

d. The tank shall have a generator power per radiated surface of at least 3 watts/in^2. The power per radiated surface area is determined by dividing the total generator power by the surface area of tank bottom or side where the generator transducers are located.

e. The tank shall be capable of being drained by the operator without the use of any additional equipment or tools.

Rinsing Tank Requirements: The rinsing tank shall be an ultrasonic tank which meets the technical and physical requirements of the previous paragraphs with the following exception:

a. The tank shall have a self-regulated heated bath capable of submerging the oxygen components to be rinsed. The bath shall be capable of being heated to and maintaining a temperature of at least 110°F and not more than 170°F. The tank shall be capable of reaching 110°F within 45 minutes of turning the heating unit(s) on.

Hazardous Materials:

A hazardous material (HM) is any material that: (1) is regulated as a hazardous material per 49 CFR 173.2; or (2) requires a Material Safety Data Sheet per 29 CFR 1910.1200; or (3) during end use, treatment, handling, packaging, storage, transportation, or disposal meets or has the potential to meet the definition of a hazardous waste as defined by 40 CFR 261 Subparts A, B, C, or D; or (4) is regulated as an Ozone Depleting Substance (ODS) per 40 CFR 82 Subpart A, Appendices A and B; or (5) is identified in the Clean Air Act, (40 CFR 51) Chapter 85, Subchapter I-7412, as a hazardous air pollutant. The use of any potentially HM with the exception of Navy Oxygen Cleaner shall be avoided at all times. In the event that a HM must be used, approval shall be obtained from NAWCADLKE. All HM that are approved for use shall be conspicuously marked as described in Federal Standard No. 313.

> **Class I Ozone Depleting Substances (ODSs):** No Class I ODS(s), as defined in Title VI of the Clean Air Act, nor materials containing Class I ODSs as an ingredient may be used or specified for any phase of the system's life cycle.
> **Navy Oxygen Cleaner(NOC):** NOC is authorized for use during all phases of the system's life cycle. Disposal of NOC shall be in accordance with State and Local regulations.

Fluid Compatibility:

The system shall be compatible with the following solutions when at room temperature and when heated to the maximum temperature of the system:

a. NOC (Navy Oxygen Cleaner), trade name OCTAGON OCC-RTU, manufactured by Octagon Process Inc. 596 River Road, Edgewater, NJ 07020, NSN 6850-01-389-3859 (5 gal).

b. Demineralized water meeting U.S. Navy Grade B requirements.

c. Any combination of demineralized water listed above and NOC.

Operator Controls:

All controls to operate the system must be external and easily accessible, such that user would not be required to flip or turn the system in order to make adjustments. Operation of and access to controls should not require tools.

> **Warning Light:** An indicator light shall notify the operator when the system solutions are being heated.
> **Fluid Temperature:** Fluid temperature control shall be located on the control panel.
> **Cleaning Time:** The control panel shall have a timer which will permit the operator to observe the elapsed cleaning time.

Power Requirements:

The system must be able to operate on external 110 VAC ±10% at 50/60 Hz. Operation of the system should not be dependent upon external pressurized air, vacuum service or consumable power sources (e.g., batteries, air cylinders). The electrical components of the system must be certified or built to an industry standard such as Underwriters Laboratory, the National Electrical Code, National Electrical Manufactures Association Standards, National Fire Protection Agency Standards or similar.

Voltage and Frequency Transient: The system must not be damaged nor its performance degraded when subjected to the Voltage and Frequency Transient Test.
Voltage Spike: The system must not be damaged nor its performance degraded when subjected to the Voltage Spike Test.
Power Cords and Receptacles. The system must be capable of mating with common utility type receptacles (2 prong with a ground).

Cleaning and Rinsing Requirements:

The system shall be capable of cleaning and rinsing a contaminated sample in accordance with the approved cleaning and rinsing test plan submitted by the contractor per CDRL C007.

Cleaning and Rinsing Solutions: The cleaning solution shall be a solution of NOC diluted 25% with demineralized water. The rinsing solution shall be 100% demineralized water.
Cleaning and Rinsing Time: The cleaning and rinsing of a contaminated sample shall be accomplished within 25 minutes after the solutions have reached their minimum required temperatures.
Verification of Cleanliness: Verification of the cleanliness of a contaminated sample after the sample has been cleaned and rinsed shall be completed.

Size:

Size of the system must not exceed 36 inches in length and 24 inches in width. The system shall be capable of fitting through a doorway 26 inches wide by 66 inches tall.

Environmental Conditions:

The system shall withstand the following environmental conditions without damage or performance degradation.

High Temperature Requirements: The system must not be damaged nor its performance degraded when exposed to the following conditions and when tested.
Non-Operating: 145°F at 14% to 44% relative humidity when in non-operating mode.
Operating: 110°F at 14% to 44% relative humidity when in operating mode.

Low Temperature Requirements: The system must not be damaged nor its performance degraded when exposed to the following conditions and when tested.
Non-Operating: -20°F when in non-operating mode.

Operating: 40°F when in operating mode.

Humidity: When in operating mode, the system must not be damaged nor its performance degraded when exposed to 95% to 100% relative humidity at 75°F constant temperature and when tested.

Shock and Vibration:

Bench Handling Shock: When in non-operating mode, the system must be able to withstand the usual level of shock encountered during typical bench maintenance or repair.
Transportation Vibration: When in non-operating mode and when packaged in accordance with the contract, the system must withstand basic transportation vibrations.
Shipboard Vibration: The system must be able to operate without performance degradation after being subjected to vibration frequencies from 1 to 50 Hz at an Power Spectral Density (PSD) of 0.001 g^2/Hz.

Static List:

Non-Operating: When in non-operational mode and when filled to the maximum operating levels with cleaning and rinsing solutions the system shall not spill or leak solutions when placed on a surface tilted 15° from the horizontal.
Operating: The system must be able to operate and not spill or leak solutions when filled to the maximum operating levels with cleaning and rinsing solutions and when on a surface tilted 10° from the horizontal.

Electromagnetic Compatibility (EMI):

The system must pass all appropriate EMI requirements defined by MIL-STD-461 for A4 part 5 for shipboard equipment located below deck.

Reliability:

The system shall have a minimum Mean Time Between Failure (MTBF) of 50 hours, and a predicted MTBF of 150 hours or greater when used in accordance with the conditions described herein.

Maintainability:

The system's design shall have a Mean Time To Repair (MTTR) of 1.5 hours when performed by the I-Level. The MTTR shall include both corrective and preventive maintenance. Expected maintenance tasks are: inspection, self-test (if applicable) , wire integrity, repair by modules or vendor components, replacement and minor repairs (replace knobs, front panels, switches, transducers, digital read-outs, controls, etc.).

Maintainability Design Requirements: The system's design shall provide modularity, accessibility, and other human engineering features to ease maintenance burden. Cutting and unsoldering of replaceable items shall be minimized.

<u>Safety</u>:

The system shall be designed to provide for the safety of personnel during installation, operation, maintenance, and repair of the system or of the components. Safety design criteria shall include:

> **Personnel Safety:** The system shall be designed to minimize the probability and severity of injury to personnel. All material shall be non-toxic and non-combustible.
> **Mechanical Safety:** Finished items shall bear no raw, sharp, or rough metal edges on any part. Safeguards shall be installed to prevent inadvertent actuation or entrapment of body parts or clothing.
> **Electrical Safety:** All electrical circuits shall be safely grounded. Cautions and warnings shall be posted for any power supplies. Electrical safety shall be paramount when performing maintenance.
> **Environmental Safety:** System design shall consider occupational safety and health standards. Hazardous materials shall be avoided, with the exception of NOC. Surface hot spots accessible to personnel shall not exceed 140°F at 100°F ambient or below.

COMPETITIVE INITIATIVE
PAINT GUN WASHER
GENERAL DESCRIPTION

P2 Opportunity: Minimize paint thinner waste and solvent-soaked rags. Eliminate VOC emissions. Provide an alternative to the labor-intensive task of manually cleaning paint guns.

Equipment Description: The paint gun washer is an automated, closed-loop system that flushes and cleans paint guns. The solvent is reused numerous times before disposal is required, thereby reducing the quantity of spent solvent and rags that must be disposed of as hazardous waste.

Implementation Requirements:

- Electric: No power requirements. The unit must be electrically grounded.
- Compressed air: 1/4 npt (f) air inlet
- Pressure operating range: 25 to 100 psi
- Optional 25' hose available to connect unit air inlet to shop air line
- Air pressure regulator, master air valve, 1/4 npt (m) coupler included for ease of installation.

Benefits:

- Reduce labor to clean paint guns manually.
- Reduce quantity of solvent used in cleaning process.
- Reduce costs by decreasing waste solvent, paint rags, and process time.
- Meet stringent air quality rules, including South Coast Air Quality Management (SCAQMD) Rule 1171 for VOC emissions.

Other Information: Solvents used in the unit should be selected based on the type of coatings to be removed. Attempt to select the least hazardous applicable solvent.

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Vendor(s): Graco, Inc. — Model: 112-636
Government Sales Department

Cost: $1,245

COMPETITIVE INITIATIVE
PAINT GUN WASHER
TECHNICAL SPECIFICATION

The Graco PRO-WASH Gun Washer, Model 112-636, is designed to handle solvent-based and water-based coatings. The standard cleaning station configuration includes one station for siphon-feed type, conventional spray guns; one station for pressure/siphon cups; and two stations for pressure-feed type, conventional spray guns. The pump shall automatically shut off when the lid is lifted. The paint gun washer shall be closed during both cleaning operations and non-cleaning operations, and opened only for placement of guns to be cleaned and maintenance. The unit shall be delivered with secure welds, and shall be free of leakage.

Facility Interface Requirements:

Overall Dimensions: Not to exceed 50" long x 30" wide x 30" high
Compressed Air Requirements: 25-100 psi operating range; air inlet 1/4 npt (female) coupler.
Other: Air pressure regulator, master air valve, 1/4 npt (male) coupler (included with unit) are installed as part of the air line connection process. A stand shall be included with the unit so that no mounting is required. 15' grounding wire with clamp is included.

Minimum Requirements:

Door Swing: 30" maximum
Stations: (1) gun; (1) cup; (2) HVLP guns; (1) Pressure pots up to 2.5 gallons, paint cans up to 5 gallons
Pump: double diaphragm type
Tank: stainless steel
Fluid manifold: stainless steel
Lid: stainless steel
Maximum tank capacity: 5 gallons
Dry Weight: not to exceed 80 lbs.
Cleaning time: 3 minutes (maximum)
Features: Stainless steel tub, stainless steel fluid manifold, hose cleaning capability, stainless steel foot pedal activated lid, pot cleaning device.

Optional Features to be Included with Each Unit:

FEATURE	DESCRIPTION
0001	**Long Gun Support** The Graco Long Gun Support, P/N 512-800, is designed to clean pressure feed, air spray, and high volume low pressure (HVLP) guns.

0002 **Short Gun Support**

The Graco Short Gun Support, P/N 112-847, is designed to clean siphon air spray, air assisted, and airless guns.

0003 **Spray Nozzle**

The Graco Spray Nozzle, P/N 512-799, is designed to clean both siphon and pressure cups.

0004 **Pot/Paint Can Kit**

The Graco Pot/Paint Can Kit, P/N 236-906, is designed to clean pressure pots up to 2.5 gallons, paint cans up to 5 gallons, and similar paint containers. The height shall not exceed 14.5", and the diameter shall not exceed 11".

COMPETITIVE INITIATIVE
PARTICLE COUNTER
GENERAL DESCRIPTION

P2 Opportunity: Reduce usage of P-D-680 solvent and waste fluid associated with patch test contamination measurement of aircraft hydraulic fluids.

Equipment Description: The UCC particle counter P/N CM20.9090 is a self-contained benchtop unit. The unit has an optional ultrasonic water bath to reduce testing time. The unit measures particulate contamination by white light obscuration and does not require solvent dilution to process fluid samples. The system is compatible with the 4-oz. bottles currently supplied for patch test kits.

Implementation Requirements:

- Electrical: 115V, 60 Hz
- Size: 17" long x 6" wide x 19" high

Benefits:

- Eliminate the need for solvent (P-D-680) dilution of hydraulic fluids.
- Reduce the amount of waste fluid.
- Reuse specimen fluid by adding to similar fluids for reconditioning using hydraulic purifiers.
- Achieve objective particle counts.
- Reduce process time to obtain measurements.
- Provide records of data measurements.
- Provide user-defined output data format.

Other Information:

- System is applicable to other fluids when using compatible sensors.
- Calibration fluid provided with unit.
- Unit can quantify measurements in the following standards: NAS 1638, ISO, MIL-STD-1646A, and FED-STD-209D.

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Vendor(s): UCC, Inc. — Model: CM20.9090

Cost: $7,596

COMPETITIVE INITIATIVE
PARTICLE COUNTER
TECHNICAL SPECIFICATION

The particle counter provides a solvent-free method of determining the particulate cleanliness level of various fluids. Solvent use would be limited to maintenance or flushing unit between sampling of incompatible or immiscible fluid samples. This particulate contamination monitoring system supports the Navy Oil Analysis Program (NOAP) present requirements for ship fluid samples, as well as the Aircraft Hydraulic Contamination Control Program requirements for fluid samples from aircraft and support equipment (SE). The system shall include all accessories necessary to analyze fluids in sample bottles, print results and operate at Navy/Marine shipboard and landbased intermediate maintenance activities (IMA), NOAP labs and training centers and Navy Aviation Depots (NADEPs).

Facility Interface Requirements:

Overall Dimensions: 30" long x 25" wide x 20" high
Power Requirements: 110 V AC (+/- 10%) at 50/60 Hz, and 115 VAC shipboard at 60 Hz.
Space Requirements: This is a benchtop unit requiring no more than 4 feet of linear space, and depth no less than 25 inches.

Industry Standards:

NAS 1638	Cleanliness Requirements of Parts Used in Hydraulic Units
ISO 4402	Hydraulic Fluid Power-Calibration of Automatic Count Instruments for Particles Suspended in Liquids-Method Using Classified AC Fine Test Dust Contaminant Second Edition
ISO 4406	Hydraulic Fluid Power-Fluids-Method for Coding Level of Contamination by Solid Particles First Edition

Minimum Requirements:

Weight: Unit must not weigh more than 44 lbs.
Hazardous Materials: Operation and maintenance of the unit must not require nor generate any hazardous or environmentally unacceptable material as defined under FED-STD-313,ozone depleting substances (ODS) in Title VI of the Clean Air Act or hazardous air pollutants in Title I, Part A of the Clean Air Act. The discharge of analyzed fluid samples classified as hazardous material prior to testing is the only exception to this requirement as long as additional hazardous or environmentally materials, ODS or pollutants are not generated or required.

Solvent Use: Should be limited to maintenance or flushing unit between sampling of incompatible fluid samples. Operation of the unit must not require the use of additional solvents.
Fluid Compatibility: Unit must be compatible and able to analyze the following fluids in an undiluted state.

MIL-H-5606	MIL-H-83282	MIL-H-6083	MIL-H-46170
MIL-H-17672	MIL-H-19457	MIL-H-22072	MIL-L-17331
MIL-L-9000	MIL-C-47220	MIL-C-87252	MIL-L-23699

Phosphate Esters (e.g., SKYDROL)

Unit should be able to handle undiluted fluid samples having kinematic viscosities up to 300 centistokes at a room temperature of 70°F.
Data Output: The unit must be able to display and print the results. An RS232 port must be provided with the unit to download results to an IBM pc compatible computer. The unit shall allow the user to select report results in accordance with Navy Standard Class (Table 1), ISO 4406 or NAS 1638 by actual particle counts (in their respective size ranges), and by class or code. Unit must be supplied with a printer or have a built-in printer to allow test results to be immediately printed after sample analysis.
Operator Controls: All controls to operate or calibrate the unit must be external and easily accessible, such that user would not be required to open panels or to flip or turn unit in order to make adjustments. Operation of and access to controls should not require tools.
Batch Sampling: The unit must be capable of analyzing fluid from sample bottles. The volume of the fluid sample required to perform a complete analysis should not exceed 50 ml. In addition, the unit must be able to test from the following size sample bottle.
Time: The time to prepare sample, analyze fluid, and generate test results within 17 minutes.
Accuracy: The unit must be able to detect if a fluid sample equals or exceeds the particulate contamination criteria for fluids listed below:

Navy Standard Class 3 as per NAVAIR 01-1A-17 manual
Navy Standard Class 5 as per NAVAIR 01-1A-17 manual
ISO Code Range from 11/8 to 19/16

The accuracy of the unit must be within ± 10% as determined from actual particle counts for the applicable particle size and particle concentration ranges in the following table and for Navy Standard Class and ISO Codes listed above.

Particulate	Particles per 100 ml sample	
Micron size Ranges	**Min. Indication**	**Max. Indication**
over 5	100	> 500k
over 15	13	> 64k
25 - 50	100	4k
50 - 100	20	800
over 100	4	130

Repeatability: The unit must be able to give repeatable results when retested on the fluid samples drawn from the same batch of contaminated fluid. All results should be within ±5% of the mean of 10 or more particle counts.
Calibration: Standards to verify the state of calibration and to calibrate the unit should be based on ACFTD contaminant suspended in MIL-H-83282 or MIL-H-5606. The unit must be able to use calibration standards produced by a source independent of the company supplying the unit. The unit must be capable of being calibrated by the operator.
External Power Requirements: Operation of unit should not be dependent upon external pressurized air, vacuum service or consumable power sources (e.g., batteries, air cylinders).

COMPETITIVE INITIATIVE
PLASTIC MEDIA BLAST BOOTH
GENERAL DESCRIPTION

P2 Opportunity: Improve depainting efficiency and eliminate the use of chemicals. Naval stations generally use methylene chloride stripping and mechanical sanding to remove dry paint and surface corrosion from aircraft parts and ground support equipment.

Equipment Description: This unit features a walk-in blast room that is 15' wide x 12' high x 20' long. The unit includes sweep-in blast media recovery, cyclone separator with dual air wash media reclaimer, high-volume media storage hopper, pressure vessel, dust collector with blower, operator safety equipment with breathing filter, dense particle separator (needed to work on aircraft parts while recycling the plastic media), air compressor, and dryer (needed to adjust for high humidity).

Implementation Requirements:

- Electrical: 460 VAC, 60 Hz, 3 phase, 200 A (minimum)
- Electrical disconnect at air compressor and air dryer (if required by local regulations)
- Level concrete floor and grouting
- Government approval permits and documentation
- Covered facility for blast booth, blast system, and support equipment
- Forklift for unloading and installation
- Insurance
- Appropriate plastic media

Benefits:

- Eliminate use of toxic chemicals.
- Meet stringent air pollution requirements.
- Improve depainting efficiency.

Other Information: Stripping of aircraft components must be performed in accordance with NAVAIR requirements. NAVAIR does not allow blasting of aircraft components that are subject to nondestructive inspection.

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Vendor(s):	Pauli Systems	Model: TBD
	Clemco, Aerolyte Systems Division	Model: TBD
Cost:	\$50,000 - \$100,000 (Booth)	
	\$15,000 - \$50,000 (Compressed air system)	
	\$20,000 - \$60,000 (Installation of booth and compressed air system)	

COMPETITIVE INITIATIVE
PLURAL COMPONENT PAINT SYSTEM
GENERAL DESCRIPTION

P2 Opportunity: Two-part paints are typically mixed before the painting operation begins. After painting is completed, the remaining paint mixture must be disposed of as hazardous waste. Plural component paint systems reduce waste because mixing occurs automatically at the spray nozzle before spraying.

Equipment Description: Each plural component paint system includes a variable ratio proportioning unit and high-volume low-pressure (HVLP) and air-assisted airless paint guns.

Implementation Requirements:

- Ventilation
- Electrical service
- Air permit, if required by locality

Benefits:

- Results in low VOC emissions.
- Eliminate hazardous waste from premixing of two-part paints.
- Requires less paint to be purchased.

Other Information: None

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Vendor(s): Pump and Equipment, Inc. — Model: System 97399

Cost: $20,000

COMPETITIVE INITIATIVE
PNEUMATIC SPILL VACUUM
GENERAL DESCRIPTION

P2 Opportunity:	Provide an efficient, safe means of recovering liquid spills. The unit will be the first response to any liquid spill. Use of the unit will reduce the amount of rags, towels, etc., that are currently required for spill clean-up.
Equipment Description:	The unit will be a pneumatically-operated dry and wet vacuum that operates similar to a household vacuum. The unit will recover liquid spills at a rate of 1 gallon per second. The unit is explosion-proof and meets all OSHA and NFPA standards. The collected spill materials will be stored in a 55-gallon drum.

Implementation Requirements:

- Compressed Air: 10 hp minimum
- 35 SCFM, 60 psig
- 1/2" npt connection
- Dimensions: 28" wide x 46" high, 150 lb (dry)

Benefits:

- Reduce quantity of rags and towels.
- Improve spill response.

Other Information:	Explosion-proof for safe recovery of spilled fuel	
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Vendor(s):	VAC-U-MAX	Model: 55
Cost:	$3,000	

COMPETITIVE INITIATIVE
POWDER COATING SPRAY SYSTEM
GENERAL DESCRIPTION

P2 Opportunity: Conventional spray paint operations generate hazardous waste through overspray and create VOC emissions. A powder coating spray system eliminates both problems through electrostatic application of powdered paint followed by heating.

Equipment Description: Typical systems consist of a booth enclosure, control panel, circulating fan, and collector module.

Implementation Requirements:

- Size: 12' high x 16' wide x 14' deep (maximum)
- Electrical: 460 VAC, 60 Hz, 3 phase, 50 A
- Air: 80 to 95 psi

Benefits:

- Eliminate booth make-up air requirements when air is returned to work environment.
- Capture and recycle up to 99% of overspray.
- Realize cost savings in labor, materials, handling, and disposal of waste.
- Provide a healthier working environment.

Other Information: None

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Vendor(s): Nordson Corporation — Model: VersaCoat Booth

P.E.D. Technologies
Fostoria, Inc.

Cost: $81,000

COMPETITIVE INITIATIVE
POWDER COATING SPRAY SYSTEM
TECHNICAL SPECIFICATION

The powder coating spray system is designed for the surface preparation and painting of mines of various configurations, including cylindrical, spherical, cubical, and other shapes. The system shall incorporate an iron phosphate cleaning/spraying station, a powder coating spray booth, manual spraying equipment, and an infrared drying/curing oven capable of curing mines of the above geometries. Whenever possible, off-the-shelf turnkey equipment is to be used in this system. The equipment shall be designed for simplicity of operation and safety to operating personnel and shall permit easy accessibility to components for normal maintenance and servicing.

Mine Design Parameters:

Geometry and dimensions of the underwater mines are as follows.

Cylindrical Mines: 55" to 132" long x 10" to 23-3/8" in diameter; weight from 500 to 2000 lbs.
Spherical Mines: 34-1/4" diameter; 580 lbs in weight
Rectangular Mines: 40" long x 29-1/4" wide x 25" high; weight from 800 to 900 lbs.

Applicable Documents:

Occupational Safety and Health Administration (OSHA) Safety and Health Standard (29 CFR 1910, 1910.1025, 1919)

EPA Title 40 CFR, Protection of the Environment

NEC Articles 250 and 300

NFPA 70, Safety Standard

NFPA 79, Electrical Standard for Industrial Machinery

UL Standard 508

San Diego County, California Air Pollution Control District (SDAPCD) Rules and Regulations

Overall System Requirements:

a. Shall not generate hazardous waste as defined by EPA Title 40 CFR.
b. Shall not emit vapors or fumes as defined by the EPA Title 40 CFR
c. Shall meet all EPA requirements and the San Diego, California Air Pollution Control District (SDAPCD) Rules and Regulations.

Overall Facility Interface Requirements:

Space Requirements: Shall fit within a 33' x 36' room and use the existing overhead hoist system for holding and manipulating the mines.
Power Requirements: 460/480 V, 3 phase power; 230 V, 1 phase power; 110-115 V, 1 phase power
Water Requirements: Standard pressure water line
Air Requirements: 90 psi dry air, 15 CFM

0001 **Powder Coating Spray Booth**
The Powder Coating Spray Booth shall be designed for batch, short-run, or special color operations and include the items as specified below.

Facility Interface Requirements:

Overall Width: 11' 8" (maximum)
Overall Height: 8' (maximum)
Working Depth: 18' 6" (maximum)
Overall Depth: 23' 8" (maximum)
Frame Requirements: The frame of the enclosure shall be constructed of stainless steel—with 18 gauge walls and ceilings and a 14 gauge floor.

Minimum Requirements:

Filtration: The booth shall include: a fire deflector curtain, a set of 24 primary synthetic filter cells, and 20 secondary synthetic filter cells. Primary filter cells shall measure approximately 20" x 20" x 3" and shall each contain one 20" x 20" x 15" primary bag filter. Secondary filter cells shall measure approximately 20" x 20" x 3" and shall each contain one 20" x 20" x 15" secondary bag filter. The filters shall be framed and gasketed.
Gauges: Two draft gauges shall be included in the booth to measure the air flow.
Crane Slot: A crane opening measuring approximately 1’ wide x 9’ long shall be positioned longitudinally in the center of the booth ceiling so that the (user-supplied) bridge crane/jib crane can be used to hold and manipulate the mine during the painting operation.
Lighting: Six fluorescent light fixtures—4 tube, 40 watt, 120 V, Class I, Division II—shall be included. The fixtures shall be enclosed and gasketed. Six fixture-mounting frame assemblies shall be included. Each fixture shall measure approximately 16" x 54".
Exhaust Blower Unit: Blower capacity shall be 11750 CFM @ 1' static pressure. The calculated face velocity shall be 125 FPM through the empty booth. The exhaust blower unit shall be comprised of the following:

- One plug exhaust blower
- One 7-1/2 hp totally enclosed ball bearing motor—230/460 V, 60 cycle, 3 phase

0002 **Iron-Phosphatizing Spray Wand Station**
The iron-phosphatizing spray wand station shall comprise the enclosure where the iron phosphatizing will be performed, as well as the equipment itself. The one-stage phosphatizing spray wand unit shall be designed to apply heated iron phosphate at high

pressure through injection into a high-pressure water stream. The design shall not include an open flame. This unit shall be used to prevent surface rust from occurring on the underwater mines. The unit shall be used to apply iron phosphate at approximately 1000 psi and can also be used for washing and rinsing in the alkaline mode at approximately 2000 psi.

Facility Interface Requirements:

Length: 58" (maximum)
Width: 29" (maximum)
Height: 47" (maximum)
Weight: Not to exceed 600 lbs. (dry), 800 lbs. (shipping)
Power Requirements: 230 V, 1 phase, 60 Hz, 20 A power
Water Connection: Standard female end, swivel type

Minimum Requirements:

Pump: 4 hp
Flow Rate: 4 GPM
Pressure: 1600 psi (maximum), 800 phosphatize
Safety: Unit shall shut itself off after approximately 5 minutes if unattended. A high-temperature shutoff shall be included.
Hose: 50 feet of wire braided hose with stainless steel couplings. A hose reel shall be included.
Wand: Stainless, with a dual mode that allows the operator to switch from either phosphatizing/seal rinse mode to clear rinse mode using the wand. Wand shall be trigger operated, with automatic shutoff.
Chemical Neutralizing System: The system comprises a metering pump that shall dispense the required amount of caustic (alkaline) solution to neutralize the acids in the unit. The amount of caustic solution administered will be determined through automatic monitoring of the iron phosphate solution exiting the wand. This system shall operate for approximately 2.5 hours during an 8-hour workday based on normal operation. The neutralizing system shall adjust the pH to 7 to enable the iron phosphate solution to be disposed of normally through the drain system.

Spray Enclosure:

Overall Width: 11' 8" (maximum)
Overall Height: 8' (maximum)
Working Depth: 18' 6" (maximum)
Overall Depth: 23' 8" (maximum)
Crane Slot: A crane opening measuring approximately 1' wide x 9' long shall be positioned longitudinally in the center of the ceiling of the enclosure, so that the (user-supplied) bridge crane/jib crane can be used to hold and manipulate the mine during the iron phosphatizing operation.
Ventilation: The enclosure shall replace the entire volume of air within no more than a 3-minute interval.

Lighting: Six fluorescent light fixtures—4 tube, 40 watt, 120 V, Class I, Division II—shall be included.
Drains: The enclosure shall be installed over existing drains and shall permit the existing drain system to be utilized.

0003 **Manual Powder Coating Spray Equipment**
The stand-alone manual electrostatic powder coating application system shall include a stand and interconnecting hoses and fittings. It shall be as specified below. Equipment shall be designed specifically for the use of polyester triglycidal isocyanurate (TGIC) or polyester urethane powder coating.

Facility Interface Requirements:

Power Requirements: 110 V, single phase
Compressed Air Requirements: 90 psi, 15 CFM

Minimum Requirements:

Manual Powder Gun: The handle shall be grounded. Pattern size adjustment shall be located on the rear of the gun. A two-stage trigger shall allow for manipulation of the voltage output to the gun. Gun weight shall not exceed approximately 23 oz, height shall not exceed 7", and length shall not exceed 12".
Hopper: Manual system fluidized feed hopper assembly constructed of stainless steel and having a minimum 55 lb capacity. The hopper shall include a powder feed pump.
Hoses: Attached with quick disconnects.

0004 **Infrared Drying/Curing Oven**
The drying/curing oven shall be a NEMA 12 enclosure with exhauster assembly.

Facility Interface Requirements:

Power Requirements: 480 V, 3 phase power
Overall Width: 6' maximum (Zone D)
Overall Length: 16' 8" maximum
Heated Width (Adjustable): 15" to 36" minimum (Zone A)
Heated Height: 30" minimum (Zone B)
Heated Length: 13' 4" minimum (Zone C)

Minimum Requirements:

Heater Load (Zone A): 27 kW (maximum)
Heater Load (Zone B): 27 kW (maximum)
Heater Load (Zone C): 27 kW (maximum)
Heater Load (Zone D): 27 kW (maximum)
Heater Load (Floor): 18 kW (maximum)
Heater Load (Ceiling): 12 kW (maximum)
Total Heater Load: 138 kW (maximum)

Extraction Stubs: Approximately 6" diameter, 2 each
Total Air Recirculation: 1600 CFM
Temperature Range: 350° to 400° F (air temperature) 800° to 900° F (heating element)
Control Panel: All supplied controls shall be UL listed. The oven shall incorporate a control panel with the following features:

a. Master on/off switch
b. Module selector switch
c. Emitter indicator light
d. Full power selector switch
e. Control connector loom

Target Area: 30" minimum radius
Air Circulation: Reverse convection type
Recirculation Ducts: Two per heating zone, measuring approximately 4" x 14". Each duct contains a 200 CFM fan.
Exhaust Blower: The exhaust blower shall include two 6" diameter exhaust ports (extraction stubs) on the top of the enclosure. A hood shall be located on the end of the enclosure to exhaust the air and nonvolatile residue out of the building.
Width Adjustment: Width adjustment for the enclosure shall be accomplished by having the operator manually push the walls of the unit in. The wall shall stay fixed in place by gravity.

COMPETITIVE INITIATIVE
POWER PARTS WASHER
GENERAL DESCRIPTION

P2 Opportunity: Minimize solvent waste and reduce time required to manually clean large components. Ordinarily these components require immersion in large chemical solvent tanks and hand scrubbing.

Equipment Description: The power washer is a cleaning cabinet with spray nozzles positioned along the interior walls and ceiling that blast an environmentally safe detergent in an aqueous solution onto soiled engine components. The system is entirely closed-loop, with no water discharge. The combination of high temperatures and strong blast pressure facilitates contaminant removal.

Implementation Requirements:

- Overall dimensions: 104" wide x 102" deep x 163" high
- Electric: 460V, 30 A, 60 Hz
- Water: Standard pressure (<125 psi) water line
- Heating system: 380,000 BTU/Hr forced air, pilotless ignition gas burner
- Ventilation: Must have adequate supply of combustion air in the burner area to ensure complete combustion at all times

Benefits:

- Reduce labor for cleaning parts.
- Replace hazardous solvents with a biodegradable solvent.
- Save costs in labor, materials, handling, and disposal of hazardous waste.
- Reduce quantity and toxicity of wastestream.
- Provide a healthier work environment.

Other Information: None

Procuring Activity Manager: Jill MacIntyre, 1.1.X.7.1.J.B — Tel: (908) 323-1936
Naval Air Warfare Center, Aircraft Division
Lakehurst, NJ

Technical Activity POC: Chris Mahendra, 4.8.2.5 — Tel: (908) 323-7131

Vendor(s): MART Corporation — Models: Hurricane 60 High Profile and Hurricane 60 Extended

Proceco — Model: Typhoon

Cost: $54,960 (NAB Coronado)
$62,395 (TRF Bangor)
TBD (Barbers Point)

COMPETITIVE INITIATIVE
POWER PARTS WASHER (MART HURRICANE 60 HIGH PROFILE)
TECHNICAL SPECIFICATION

Site: NAB, Coronado, CA

The MART Hurricane 60 High Profile Power Washer is a large cleaning cabinet with spray nozzles along the interior walls and ceiling that will blast an environmentally safe alkaline detergent in an aqueous solution onto soiled parts. The combination of high temperature and strong blast pressure enables the washers to remove the contaminants from the parts.

A system "equal to" the above-mentioned power washer shall contain a 70 horsepower pump system, be compatible with 460 V, 120 A, 60 Hz power, gas heat, incorporate automatic rinse and steam exhaust systems, remote lube fittings, oil skimmer, manifold pressure valve and gauge assembly, and automatic desludger/deoiler as described below. The system shall be entirely closed-loop, with no water discharge.

Facility Interface Requirements:

Overall Dimensions: 104" w x 102" l x 163" h (maximum)
Power Requirements: 460 V, 120 A, 60 Hz power
Water*:* Standard pressure (< 125 psi) water line
Ventilation: Automatic venting of water vapor created during operation to the outside. Must ensure that there is an adequate supply of combustion air in the area in which the burner is located to ensure complete combustion at all times.
Other: The unit shall be designed and constructed in order to be set in place, and anchor-bolted to the floor. Unit must be grounded in order to reduce the risk of electric shock during maintenance, troubleshooting, or repair. Instructions and drawings shall be provided to assist in the installation of the units.

Equipment Summary (Minimum Requirements):

Work Area: 60-inch diameter turntable, 75-inch work height (minimum). Designed to accommodate a workpiece of a minimum of 123 cubic feet.
Turntable: The turntable shall be designed to retract from the cabinet as the door is opened. Turntable height above floor not to exceed 36". Capacity shall be 10,000 lbs (minimum).
Weight (Empty): 6,270 lbs (maximum)
False Floor: A separate floor located above the turntable drip pan shall be provided, and shall be attached by thumb screws. The false floor shall prevent dislodged parts from falling into the solution and shall minimize steam/heat loss during non-cycling periods.
Tank Capacity: The power washer shall contain reservoir capacity and sludge capacity of a sufficient size to support operation. The unit shall contain a maximum of 400 gallons of solution, and shall have a minimum of 90 gallon sludge capacity.
Filtration: Located in front of reservoir, and configured to allow flow from five sides. Filter shall allow passage of twice rated flow at 50% plugged condition.

Sludge Removal / Oil Separation: Removes sludge and tramp oils from unit and deposits into separate container for disposal. Shall be designed to remove a minimum of 97% of particles exceeding 400 mesh size (.015" dia.) and deposit waste into sludge holding tank. Shall be controlled by the seven-day timer.
Controls: 30-minute wash timer and adjustable thermostat. Controls shall comply with safety standards of UL 508. A single phase transformer for electronic shall be mounted in its own enclosure.
Pump Motors: The pump system shall deliver 18 GPM per nozzle. Totally enclosed, fan cooled, TC frame, NEMA design B with Class F insulation, minimum service factor of 1.15 and rated for continuous duty.
Nozzles: Stainless steel threaded V-jet, with each of the 24 nozzles blasting in its own plane.
Blast Pressure: 190 psi (measured at nozzle tips).
Cycle Time: The unit shall be able to remove soils, grease, and carbon buildup in 10 to 20 minute cycles.
Cycle Temperature Requirements: The unit shall be capable of heating the detergent from 70^{o} to 185^{o}F in no more than 90 minutes, and maintaining this temperature throughout the wash cycle.
Heating System: 380,000 Btu/Hr forced air, pilotless ignition gas burner with redundant flame providing circuitry and automatic prepurge. Burner shall be capable of firing propane and natural gas with only minor adjustments.
Electronics: Main panel controls and wiring shall meet all relevant and appropriate EMA, NEC, and JIC specifications. All electrical components shall be UL approved. Wiring runs external to the main panel shall be encased in a one-piece flexible electrical conduit which terminates in compression moisture-proof fittings at either end.
Seven-Day Timer: 24-hour, 7-day, skip-a-day automatic adjustable timer with battery backup that can be set from 0 to 30 minutes in increments of one minute.
Low Water Safety Control: This device shall automatically shut off power to the heating elements if the water drops below a safe level. This will serve to protect the heating elements from burnout. In addition, the power washer shall prevent further ingress of water in the event of full water condition to prevent the water from overflowing into the shop area.
Operator Maintenance: Filter shall be designed to allow periodic cleaning without removal from the wash cabinet. External mounted grease fittings shall be provided for turntable, wash manifold, and upper door bearings. Solution shall not be discharged outside the unit for treatment or disposal.
Operator Safety: The unit shall shut down automatically upon opening of the loading door. Resetting of a start button will be required once the loading door is closed. An emergency stop button shall be prominently mounted and easily accessible.

Optional Features Included with Each Unit:

0001 **Pump System**
A 15 hp booster pump to feed suction of 55 hp main pump. The booster pump and main wash pump shall be mounted on a common base plate and piped in series.

0002 **Automatic Rinse Cycle**
The automatic rinse cycle shall deliver heated fresh water at a minimum of 2 GPM. A hand rinse wand shall be included.

0003 **Automatic Steam Exhaust**
The automatic steam exhaust shall prevent discharge of steam into the shop area or during loading/unloading of the unit.

0004 **Panel Mounted Running Time Meter**
The time meter shall show the running time logged by the unit.

0005 **Remote Grease Fittings**

0006 **Remote Upper PBM & Door Lube Fittings**
The remote grease fittings comprise externally mounted grease fittings for the turntable, blast manifold, and upper door bearing.

0007 **"High-Low" Pressure Selector Switch**

0008 **Manifold Pressure Valve and Gauge Assembly**
The manifold pressure valve and gauge assembly works in conjunction with the pressure selector switch in order to increase the pressure range of the unit. With this option, a pressure range of 25-190 psi can be obtained with this unit.

0009 **Clean Machine Automatic Desludger/Deoiler**
The Clean Machine segregates the waste streams generated in the washing process, reducing the amount of clean-out and recharging required for the cabinet reservoir. This device can operate manually or automatically, and will operate regardless of whether or not the power washer unit is in operation. A hydroclone is used to remove heavy particles, oils and greases are skimmed from the solution surface, and a scraper deposits it into a container. An oil skimmer is included in this device.

0010 **Detergent, Liquid Non-Ionic**

The detergent is identified according to the following two National Stock Numbers: 7930-00-282-9699 and 7930-00-282-9700. One (1) 55 gallon drum shall be provided. The following manufacturers are listed for this item:

C & C Distributing, Inc.
165 West Patterson Avenue
P. O. Box 12366
Ogden, UT

National Industries for the BL
524 Hamburg Turnpike
Wayne, NJ

A detergent "equal to" the above should possess, at a minimum, the following characteristics:

– The detergent shall be a liquid, nonionic surface active agent containing a minimum of 99 percent active ingredient for Type I (water soluble).
– It shall be a liquid at 77^{o}F, and a slight haze is permissible. Chemical content shall be as listed below:

  Water content: not to exceed 0.5%
  Ash content: not to exceed 0.25%
  Nitrogen content: not to exceed 0.1%
  Sulfur content: not to exceed 0.2%
  Phosphorous content: not to exceed 0.1%

– The flash point of the detergent shall be not less than 340^{o}F.
– Cloud point of the detergent shall be not less than 120^{o}F and not more than 160^{o}F.
– No cloudiness, precipitation or sediment shall be formed when the detergent is mixed with anionic and cationic wetting agents.
– Detergent shall be chemically stable to acid and oxidation.
– The pH of a 1 percent solution of the detergent in distilled water at 77^{o}F shall fall within the range of 6.0 to 8.0.
– The detergent shall have a maximum hydroxyl number of 139 mg of potassium hydroxide per gram of sample.

The container shall be durably and legibly labeled as follows:

"DETERGENT
Water Soluble, Nonionic

This product, when dissolved in either fresh water or sea water will efficiently remove grease, oil, and dirt from a wide variety of surfaces.

WARNING

Do not take internally. Keep out of eyes. Use chemical worker's goggles to prevent material from being splashed into eyes when being mixed and/or applied. In addition to goggles, a plastic face shield may be used to protect the face.

NOTE: The face shield is not to be used in lieu of chemical worker's goggles; it is an extension to the basic eye protection. If swallowed, induce vomiting and call a physician. For eyes, flush with plenty of water and get medical attention. May be irritating to the skin. Use of chemical gloves is recommended.

For most cleaning operations, 1/4 to 1/2 ounce of detergent in a gallon of fresh water or sea water, preferably hot, is sufficient. Very heavy soils may require as much as 1 ounce of product. DO NOT EXCEED RECOMMENDED MIX QUANTITY. IF CLEANING BY HAND, CHEMICAL PROTECTIVE GLOVES SHALL BE USED. SKIN IRRITATION OR OTHER ALLERGIC REACTION MAY OCCUR IF THESE INSTRUCTIONS ARE DISREGARDED. For some applications, the addition of 1 to 2 ounces of an alkali, such as sodium metasilicate or machine dishwashing compound, will improve performance. If alkalis are used, the solution shall be prepared with fresh water. Scrub, mop or wipe the solution into the oily soil and then rinse away the loosened soil with either fresh water or sea water. Cold water rinsing is satisfactory but hot water may be used when it is desired to have steel surfaces dry quickly. Small accessible areas may also be wiped dry if rinsing cannot be done easily.

Closed systems such as compressed air lines, heat exchangers and similar items may be cleaned by recirculating a hot solution of the detergent for 1 to 3 hours followed by rinsing."

The contracting activity shall be provided a material safety data sheet at time of contract award.

COMPETITIVE INITIATIVE
POWER PARTS WASHER (MART HURRICANE 60 HIGH PROFILE)
TECHNICAL SPECIFICATION

Site: Trident Refit Facility, Bangor, WA

The MART Hurricane 60 High Profile Power Washer is a large cleaning cabinet with spray nozzles along the interior walls and ceiling that will blast an environmentally safe alkaline detergent in an aqueous solution onto soiled parts. The combination of high temperature and strong blast pressure enables the washers to remove the contaminants from the parts.

A system “equal to” the above-mentioned power washer shall contain a 55 horsepower pump system, be compatible with 460 V, 30 A, 60 Hz power, gas heat, incorporate automatic rinse and steam exhaust systems, oil skimmer, and jib boom and trolley as described below. The system shall be entirely closed-loop, with no water discharge.

Facility Interface Requirements:

Power Requirements: 460 V, 30 A, 60 Hz power
Water: Standard pressure (< 125 psi) water line
Ventilation: Automatic venting of water vapor created during operation to the outside. Must ensure that there is an adequate supply of combustion air in the area in which the burner is located to ensure complete combustion at all times.
Other: The unit shall be designed and constructed in order to be set in place, and anchor bolted to the floor. Unit must be grounded in order to reduce the risk of electric shock during maintenance, troubleshooting, or repair. Instructions and drawings shall be provided to assist in the installation of the units.

Equipment Summary (Minimum Requirements):

Overall Dimensions: 104” w x 104” l x 120” h (maximum)
Construction: Cabinet shall be constructed of 7 gauge carbon steel sheet.
Work Area: 60-inch diameter turntable, 75-inch work height (minimum). Designed to accommodate a workpiece of a minimum of 123 cubic feet.
Turntable: The turntable shall be designed to retract from the cabinet as the door is opened. Turntable height above floor not to exceed 36”. Capacity shall be 10,000 lbs (minimum).
Weight (Empty): 4,500 lbs (maximum)
Tank Capacity: The power washer shall contain reservoir capacity and sludge capacity of a sufficient size to support operation. The unit shall contain a maximum of 400 gallons of solution, and shall have a maximum of 90 gallon sludge capacity.
Filtration: Located in front of reservoir, and configured to allow flow from five sides. Filter shall allow passage of twice rated flow at 50% plugged condition.
Sludge Removal / Oil Separation: Reservoir floor shall be sloped toward the drain connection in order to facilitate removal of sludge. Unit removes sludge and tramp oils from unit and deposits into separate container for disposal. Shall be designed to remove a minimum of 97% of particles exceeding 400 mesh size (.015” dia.) and deposit waste into sludge holding tank. Shall be controlled by the seven-day timer.

Controls: 30-minute wash timer and adjustable thermostat. Controls shall comply with safety standards of UL 508. A single phase transformer for electronic shall be mounted in its own enclosure.

Pump Motors: The pump system shall deliver 16.6 GPM per nozzle. Totally enclosed, fan cooled, TC frame, NEMA design B with Class F insulation, minimum service factor of 1.15 and rated for continuous duty.

Nozzles: Stainless steel threaded V-jet, with each of the 24 nozzles blasting in its own plane. Nozzles shall have a nominal flow rating of 8 GPM at 40 psig.

Blast Pressure: 190 psi (measured at nozzle tips).

Cycle Time: The unit shall be able to remove soils, grease, and carbon buildup in 20 to 30 minute cycles.

Cycle Temperature Requirements: The unit shall be capable of heating the detergent from 70^o to 185^{o}F in no more than 90 minutes, and maintaining this temperature throughout the wash cycle.

Heating System: 350,000 Btu/Hr forced air, electronic ignition forced air burner with redundant flame proving circuitry and automatic prepurge. Burner shall lock out and force resetting of the 30-minute timer if flame is not successfully proven after two successive pre-purge/ignition cycles, or if flame-out occurs.

Electronics: Main panel controls and wiring shall meet all relevant and appropriate NEMA, NEC, and JIC specifications. All electrical components shall be UL approved. Wiring runs external to the main panel shall be encased in a one-piece flexible electrical conduit which terminates in compression moisture-proof fittings at either end.

Seven-Day Timer: 24-hour, 7-day, skip-a-day, dual-channel automatic adjustable timer with battery backup that can be set from 0 to 30 minutes in increments of one minute.

Suction Strainer: A suction strainer screen shall be located in front of the reservoir tank. Strainer shall be constructed of perforated 11 gauge steel and shall allow flow from five sides. Strainer sizing shall permit passage of twice rated flow at 50% plugged condition.

Low Water Safety Control: This device shall automatically shut off power to the heating elements if the water drops below a safe level. This will serve to protect the heating elements from burnout. In addition, the power washer shall prevent further ingress of water in the event of full water condition to prevent the water from overflowing into the shop area.

Centerline Wash/Rinse Power Blast Manifold: Configuration shall permit blasting across wash area, from top downwards, and bottom upwards. Both the manifold and nozzle assembly shall oscillate by pivoting on its vertical axis as the turntable rotates. Movement of manifold *shall not* be synchronized with turntable rotational speed. The solution shall be evenly distributed over the soiled components by the manifold.

Operator Maintenance: Filter shall be designed to allow periodic cleaning without removal from the wash cabinet. External mounted grease fittings shall be provided for turntable, wash manifold, and upper door bearings. Solution shall not be discharged outside the unit for treatment or disposal. No non-steel seals requiring periodic replacement shall be used.

Operator Safety: The unit shall shut down automatically upon opening of the loading door. Resetting of a start button will be required once the loading door is closed. An emergency stop button shall be prominently mounted and easily accessible. Loading door shall contain an integral latching/locking mechanism in order to ensure that the door remains open. All motor drives and control circuits shall be positively grounded to the main panel with screw lugs. Turntable drive shall be designed such that “freewheeling” will not take place during loading/unloading. The load limit of the jib crane shall be stenciled on the horizontal beam.

<u>Optional Features Included with Each Unit:</u>

0001 **Pump System**
A 15 hp booster pump to feed suction of 40 hp main pump. The booster pump and main wash pump shall be mounted on a common base plate and piped in series.

0002 **Automatic Rinse Cycle**
The automatic rinse cycle shall deliver heated fresh water at a minimum of 2 GPM. Rinse water shall become make up water. A hand rinse wand shall be included.

0003 **Automatic Steam Exhaust**
The automatic steam exhaust shall prevent discharge of steam into the shop area or during loading/unloading of the unit.

0004 **Cabinet Insulation**
One inch thick rigid polystyrene panels shall be placed between the metal framework of all vertical surfaces and cabinet roof. Insulation shall be covered with 16 gauge steel.

0005 **Sound Insulation**
Sound insulation shall prevent sound pressure from rising above 85 dBA within a three (3) foot radius of the operator’s work station. Sound reduction shall be achieved through the use of a removable sound attenuation shield enclosing the pump drive motors.

0006 **Integral Oil Skimmer**
The integral oil skimmer (with 18” wheel) is intended to carry floating oils out of the cabinet and deposit them into a drum for disposal. Operation of the skimmer shall be automatic when set using a selector switch in the main control panel.

0007 **High/Low Pressure Switch**
The pressure regulator switch shall operate by disabling the main wash pump. In the low position, pump output shall be restricted to 7.0 GPM at approximately 50 psig manifold pressure.

0008 **False Floor/Reservoir Cover**

A separate floor located above the turntable drip pan shall be provided, and shall be attached by thumb screws. The false floor shall prevent dislodged parts from falling into the solution and shall minimize steam/heat loss during non-cycling periods.

0009 **PVC Steam Exhaust Kit**

A kit containing all steel-to-PVC piping transition flanges, gaskets, and fasteners required for connection of the Automatic Steam Exhaust shall be furnished.

0010 **Jib Boom with Trolley**

An overhead jib crane and trolley mechanism shall be provided to facilitate movement of components to and from the turntable. The jib crane shall be supported at the pivot point by a beam bolted to the rear of the cabinet and secured to the floor by a roller and track system located at the front of the cabinet. The jib crane shall be rated to support 6000 lbs. It shall extend approximately 77 inches horizontally beyond the front of the door frame.

0011 **Factory Start-Up**

The unit shall be designed and constructed to be set in place, leveled, and anchor-bolted to the floor. Factory start-up training of at least 8 hours shall be provided by the contractor.

0012 **Detergent, Liquid Non-Ionic**

The detergent is identified according to the following two National Stock Numbers: 7930-00-282-9699 and 7930-00-282-9700. One (1) 55 gallon drum shall be provided. The following manufacturers are listed for this item:

C & C Distributing, Inc.
165 West Patterson Avenue
P. O. Box 12366
Ogden, UT

National Industries for the BL
524 Hamburg Turnpike
Wayne, NJ

A detergent “equal to” the above should possess, at a minimum, the following characteristics:

– The detergent shall be a liquid, nonionic surface active agent containing a minimum of 99 percent active ingredient for Type I (water soluble).

– It shall be a liquid at 77^{o}F, and a slight haze is permissible. Chemical content shall be as listed below:

Water content: not to exceed 0.5%
Ash content: not to exceed 0.25%
Nitrogen content: not to exceed 0.1%
Sulfur content: not to exceed 0.2%
Phosphorous content: not to exceed 0.1%

- The flash point of the detergent shall be not less than 340^{o}F.
- Cloud point of the detergent shall be not less than 120^{o}F and not more than 160^{o}F.
- No cloudiness, precipitation or sediment shall be formed when the detergent is mixed with anionic and cationic wetting agents.
- Detergent shall be chemically stable to acid and oxidation.
- The pH of a 1 percent solution of the detergent in distilled water at 77^{o}F shall fall within the range of 6.0 to 8.0.
- The detergent shall have a maximum hydroxyl number of 139 mg of potassium hydroxide per gram of sample.

The container shall be durably and legibly labeled as follows:

DETERGENT
Water Soluble, Nonionic

This product, when dissolved in either fresh water or sea water, will efficiently remove grease, oil, and dirt from a wide variety of surfaces.

WARNING

Do not take internally. Keep out of eyes. Use chemical worker's goggles to prevent material from being splashed into eyes when being mixed and/or applied. In addition to goggles, a plastic face shield may be used to protect the face.

NOTE: The face shield is not to be used in lieu of chemical worker's goggles; it is an extension to the basic eye protection. If swallowed, induce vomiting and call a physician. For eyes, flush with plenty of water and get medical attention. May be irritating to the skin. Use of chemical gloves is recommended. For most cleaning operations, 1/4 to 1/2 ounce of detergent in a gallon of fresh water or sea water, preferably hot, is sufficient. Very heavy soils may require as much as 1 ounce of product. DO NOT EXCEED RECOMMENDED MIX QUANTITY. IF CLEANING BY HAND - CHEMICAL PROTECTIVE GLOVES SHALL BE USED. SKIN IRRITATION OR OTHER ALLERGIC REACTION MAY OCCUR IF THESE INSTRUCTIONS ARE DISREGARDED. For some applications, the addition of 1 to 2 ounces of an alkali, such as sodium metasilicate or machine dishwashing compound, will improve performance. If alkalis are used, the solution shall be prepared with fresh water. Scrub, mop or wipe the solution into the oily soil and then rinse away the loosened soil with either fresh water or sea water. Cold water rinsing is satisfactory but hot water may be used when it is desired to have steel surfaces dry quickly. Small accessible areas may also be wiped dry if rinsing cannot be done easily.

Closed systems such as compressed air lines, heat exchangers and similar items may be cleaned by recirculating a hot solution of the detergent for 1 to 3 hours followed by rinsing."

The contracting activity shall be provided a material safety data sheet at time of contract award.

COMPETITIVE INITIATIVE
POWER PARTS WASHER (PROCECO TYPHOON)
TECHNICAL SPECIFICATION

Site: NAS Barbers Point, HI

The Proceco Typhoon Model HD 60-72-G-10000-CT-2-RD Power Washer is a large cleaning cabinet that will blast an environmentally safe alkaline detergent in an aqueous solution onto soiled parts. The combination of high temperature and strong blast pressure enables the washers to remove the contaminants from the parts.

A system “equal to” the above-mentioned power washer shall contain a 20 horsepower first stage pump system, a 7.5 horsepower second stage pump system, be compatible with 460 V, 3 phase, 60 Hz power, gas heat, incorporate automatic rinse and steam exhaust systems, oil skimmer, manifold pressure valve and gauge assembly, high volume recirculating rinse, and automatic desludger/deoiler as described below. The system shall be entirely closed-loop, with no water discharge.

Equipment Summary (Minimum Requirements):

Overall Dimensions: 109” w x 141” l x 144” h (maximum)
Work Area: 60-inch diameter turntable, 72-inch work height (minimum). Designed to accommodate a workpiece of a minimum of 123 cubic feet.
Turntable: The turntable shall be designed to retract from the cabinet as the door is opened. Turntable height above floor not to exceed 61”. Capacity shall be 10,000 lbs (minimum).
Weight (Empty): 11,500 lbs (maximum)
Construction / Machinery: Carbon steel.
False Floor: A separate floor located above the turntable drip pan shall be provided, and shall be attached by thumb screws. The false floor shall prevent dislodged parts from falling into the solution and shall minimize steam/heat loss during non-cycling periods.
Tank Capacity: The power washer shall contain reservoir capacity of a sufficient size to support operation. The unit shall contain a minimum of 400 gallons of solution for the first stage, and a minimum of 200 gallons for the second stage.
Filtration: Located in front of reservoir, and configured to allow flow from five sides. Filter shall allow passage of twice rated flow at 50% plugged condition.
Controls: 30-minute wash timer and adjustable thermostat. Controls shall comply with safety standards of UL 508. A single phase transformer for electronic shall be mounted in its own enclosure.
Pump System: Pump for first stage shall be 20 hp, 300 GPM @ 60 psi. Second stage pump shall be 7.5 hp, 115 GPM @ 60 psi.
Pump Motors: The pump system shall deliver at least 9 GPM per nozzle. Totally enclosed, fan cooled, TC frame, NEMA design B with Class F insulation, minimum service factor of 1.15 and rated for continuous duty.

Nozzles: Stainless steel threaded V-jet, with each of the 44 nozzles blasting in its own plane. For the first stage, there are 32 nozzles, and for the second stage there are 12 nozzles.
Blast Pressure: Minimum 140 psi (measured at nozzle tips).
Cycle Time: The unit shall be able to remove soils, grease, and carbon buildup in 10 to 20 minute cycles.
Cycle Temperature Requirements: The unit shall be capable of heating the detergent from 70^{o} to 185^{o}F in no more than 120 minutes, and maintaining this temperature throughout the wash cycle.
Heating System: 360,000 Btu/Hr forced air, pilotless ignition gas burner with redundant flame providing circuitry and automatic prepurge. Burner shall be capable of firing propane and natural gas with only minor adjustments.
Electronics: Main panel controls and wiring shall meet all relevant and appropriate NEMA, NEC, and JIC specifications. All electrical components shall be UL approved. Wiring runs external to the main panel shall be encased in a one-piece flexible electrical conduit which terminates in compression moisture-proof fittings at either end.
Operator Maintenance: Filter shall be designed to allow periodic cleaning without removal from the wash cabinet. External mounted grease fittings shall be provided for turntable, wash manifold, and upper door bearings. Solution shall not be discharged outside the unit for treatment or disposal.
Operator Safety: The unit shall shut down automatically upon opening of the loading door. Resetting of a start button will be required once the loading door is closed. An emergency stop button shall be prominently mounted and easily accessible.

<u>Facility Interface Requirements:</u>

Power Requirements: 460 V, 3 phase, 60 Hz power.
Water: Standard pressure (< 125 psi) water line.
Ventilation: Automatic venting of water vapor created during operation to the outside. Must ensure that there is an adequate supply of combustion air in the area in which the burner is located to ensure complete combustion at all times.
Other: The unit shall be designed and constructed in order to be set in place, and anchor-bolted to the floor. Unit must be grounded in order to reduce the risk of electric shock during maintenance, troubleshooting, or repair. Instructions and drawings shall be provided to assist in the installation of the units.

<u>Optional Features Included with Each Unit:</u>

0001 **High Volume Recirculating Rinse**
Recirculating second stage of the wash cycle, per Proceco Item 20. A hand rinse wand shall be provided.

0002 **Low Water Safety Control**
Proceco Item 40. This device shall automatically shut off power to the heating elements if the water drops below a safe level during first and second stages. This will serve to protect the heating elements from burnout. In addition, the power

washer shall prevent further ingress of water in the event of full water condition to prevent the water from overflowing into the shop area.

0003 **Automatic Steam Exhaust**
Proceco Item 50. The automatic steam exhaust shall prevent discharge of steam into the shop area or during loading/unloading of the unit. It shall contain a 500 CFM blower.

0004 **Oscillating Center Nozzle**
Proceco Item 100. The unit shall be equipped with an oscillating center nozzle pipe system to support first stage, second stage, and fresh water rinse. This item shall be designed to clean the inside of cylindrical surfaces. The center nozzle shall retract in the event of coming into contact with parts so as not to damage them.

0005 **Turntable Capacity**
Turntable height above floor not to exceed 61”. Capacity shall be 10,000 lbs (minimum). Proceco Item 160.

0006 **Gas Heating System**
This shall be a 360,000 Btu/Hr forced air, pilotless ignition gas burner with redundant flame providing circuitry and automatic prepurge. Burner shall be capable of firing propane and natural gas with only minor adjustments. Proceco Item 170.

0007 **Seven-Day Timer**
Proceco Item 320. This device shall be a 24-hour, 7-day, skip-a-day automatic adjustable timer with battery backup that can be set from 0 to 30 minutes in increments of one minute.

0008 **Cycle Completion Light**
A light shall illuminate to alert the operator of the completion of each cycle. Proceco Item 330.

0009 **Automatic Sludge Removal Conveyor**
Proceco Item 220. This device shall remove sludge and tramp oils from the unit and deposit into a separate container for disposal. Shall be designed to remove a minimum of 97% of particles exceeding 400 mesh size (.015” dia.) and deposit waste into sludge holding tank. Shall be controlled by the seven-day timer.

0010 **Integral Oil Skimmer**
Proceco Item 570. The integral oil skimmer is intended to carry floating oils out of the cabinet and deposit them into a drum for disposal. Operation of the skimmer shall be automatic.

0011 **Small Parts Basket**

The small parts basket, Proceco Item 620, shall be placed inside the cleaning chamber of the unit. The basket shall be constructed from stainless steel wire mesh with 1/4 inch or 3/4 inch openings and 3/8 inch stainless steel rods throughout. The minimum interior dimensions of the basket shall be 48 inches in diameter by 8 inches high. The parts basket shall be able to withstand the temperature and water pressure exerted on it by the parts washer. The basket shall have a hinged lid and lift bar. The parts basket is able to support a minimum of 100 lbs.

0012 **Detergent, Liquid Non-Ionic**

The detergent is identified according to the following two National Stock Numbers: 7930-00-282-9699 and 7930-00-282-9700. One (1) 55 gallon drum shall be provided. The following manufacturers are listed for this item:

C & C Distributing, Inc.
165 West Patterson Avenue
P. O. Box 12366
Ogden, UT

National Industries for the BL
524 Hamburg Turnpike
Wayne, NJ

A detergent "equal to" the above should possess, at a minimum, the following characteristics:

- The detergent shall be a liquid, nonionic surface active agent containing a minimum of 99 percent active ingredient for Type I (water soluble).
- It shall be a liquid at 77^{o}F, and a slight haze is permissible.
- Chemical content shall be as listed below:

  Water content: not to exceed 0.5%
  Ash content: not to exceed 0.25%
  Nitrogen content: not to exceed 0.1%
  Sulfur content: not to exceed 0.2%
  Phosphorous content: not to exceed 0.1%

- The flash point of the detergent shall be not less than 340^{o}F.
- Cloud point of the detergent shall be not less than 120^{o}F and not more than 160^{o}F. No cloudiness, precipitation or sediment shall be formed when the detergent is mixed with anionic and cationic wetting agents.
- Detergent shall be chemically stable to acid and oxidation.
- The pH of a 1 percent solution of the detergent in distilled water at 77^{o}F shall fall within the range of 6.0 to 8.0.
- The detergent shall have a maximum hydroxyl number of 139 mg of potassium hydroxide per gram of sample.

The container shall be durably and legibly labeled as follows:

“DETERGENT
Water Soluble, Nonionic

This product, when dissolved in either fresh water or sea water, will efficiently remove grease, oil, and dirt from a wide variety of surfaces.

WARNING

Do not take internally. Keep out of eyes. Use chemical worker’s goggles to prevent material from being splashed into eyes when being mixed and/or applied. In addition to goggles, a plastic face shield may be used to protect the face.

NOTE: The face shield is not to be used in lieu of chemical worker’s goggles; it is an extension to the basic eye protection. If swallowed, induce vomiting and call a physician. For eyes, flush with plenty of water and get medical attention. May be irritating to the skin. Use of chemical gloves is recommended.

For most cleaning operations, 1/4 to 1/2 ounce of detergent in a gallon of fresh water or sea water, preferably hot, is sufficient. Very heavy soils may require as much as 1 ounce of product. DO NOT EXCEED RECOMMENDED MIX QUANTITY. IF CLEANING BY HAND - CHEMICAL PROTECTIVE GLOVES SHALL BE USED. SKIN IRRITATION OR OTHER ALLERGIC REACTION MAY OCCUR IF THESE INSTRUCTIONS ARE DISREGARDED. For some applications, the addition of 1 to 2 ounces of an alkali, such as sodium metasilicate or machine dishwashing compound, will improve performance. If alkalis are used, the solution shall be prepared with fresh water. Scrub, mop or wipe the solution into the oily soil and then rinse away the loosened soil with either fresh water or sea water. Cold water rinsing is satisfactory but hot water may be used when it is desired to have steel surfaces dry quickly. Small accessible areas may also be wiped dry if rinsing cannot be done easily.

Closed systems such as compressed air lines, heat exchangers and similar items may be cleaned by recirculating a hot solution of the detergent for 1 to 3 hours followed by rinsing.”

The contracting activity shall be provided a material safety data sheet at time of contract award.

COMPETITIVE INITIATIVE
POWER PARTS WASHER (MART HURRICANE 60 EXTENDED)
TECHNICAL SPECIFICATION

Site: Trident Refit Facility, Bangor, WA

The MART Hurricane 60 Extended Power Washer is a large cleaning cabinet with spray nozzles along the interior walls and ceiling that will blast an environmentally safe alkaline detergent in an aqueous solution onto soiled parts. The combination of high temperature and strong blast pressure enables the washers to remove the contaminants from the parts.

A system "equal to" the above-mentioned power washer shall contain a 55 horsepower pump system, be compatible with 460 V, 30 A, 60 Hz power, gas heat, incorporate automatic rinse and steam exhaust systems, false floor, thermal insulation, sound insulation, remote lube fittings, oil skimmer, and centerline wash/rinse manifolds as described below. The system shall be entirely closed-loop, with no water discharge.

Facility Interface Requirements:

Overall Dimensions: 104" wide x 102" long x 243" high
Power Requirements: 460 V, 30 A, 60 Hz.
Water Requirements: Standard pressure (<125 psi) water line. Water is used for replenishing solution, for low water shutoff safety feature, and for rinsing parts.
Ventilation: Six-inch steam exhaust vent provided for automatic venting of water vapor created during operation to the outside of the building. Must ensure that there is an adequate supply of combustion air in the area in which the burner is located to ensure complete combustion at all times.
Other: The unit shall be designed and constructed in order to be set in place, and anchor bolted to the floor. Unit must be grounded in order to reduce the risk of electric shock during maintenance, troubleshooting, or repair. Instructions and drawings shall be provided to assist in the installation of the unit.

Equipment Summary (Minimum Requirements):

Work Area: 60-inch diameter turntable, 112-inch work height (minimum)
Turntable: The turntable shall be designed to retract from the cabinet as the door is opened. Turntable height above floor not to exceed 36". Capacity shall be 10,000 lbs (minimum).
Weight (Empty): 6,270 lbs (maximum)
False Floor: A separate floor located above the turntable drip pan shall be provided, and shall be attached by thumb screws. The false floor shall prevent dislodged parts from falling into the solution and shall minimize steam/heat loss during non-cycling periods.
Tank Capacity: The power washer shall contain reservoir capacity and sludge capacity of a sufficient size to support operation. The unit shall contain a maximum of 400 gallons of solution, and shall have a minimum of 90 gallon sludge capacity.

Filtration: Located in front of reservoir, and configured to allow flow from five sides. Filter shall allow passage of twice rated flow at 50% plugged condition.
Sludge Removal / Oil Separation: Removes sludge and tramp oils from unit and deposits into separate container for disposal. Shall be designed to remove a minimum of 97% of particles exceeding 400 mesh size (.015" dia.) and deposit waste into sludge holding tank. Shall be controlled by the seven-day timer.
Controls: 30-minute wash timer and adjustable thermostat. Controls shall comply with safety standards of UL 508. A single phase transformer for electronic shall be mounted in its own enclosure.
Pump Motors: The pump system shall deliver 16.6 GPM per nozzle. Totally enclosed, fan cooled, TC frame, NEMA design B with Class F insulation, minimum service factor of 1.15 and rated for continuous duty.
Nozzles: Stainless steel threaded V-jet, with each of the 24 nozzles blasting in its own plane.
Blast Pressure: 160 psi (measured at nozzle tips).
Cycle Time: The unit shall be able to remove soils, grease, and carbon buildup in 10 to 20 minute cycles.
Cycle Temperature Requirements: The unit shall be capable of heating the detergent from 70^o to 185^{o}F in no more than 90 minutes, and maintaining this temperature throughout the wash cycle.
Heating System: 380,000 Btu/Hr forced air, pilotless ignition gas burner with redundant flame providing circuitry and automatic prepurge. Burner shall be capable of firing propane and natural gas with only minor adjustments.
Electronics: Main panel controls and wiring shall meet all relevant and appropriate NEMA, NEC, and JIC specifications. All electrical components shall be UL approved. Wiring runs external to the main panel shall be encased in a one piece flexible electrical conduit which terminates in compression moisture-proof fittings at either end.
Seven-Day Timer: 24-hour, 7-day, skip-a-day automatic adjustable timer with battery backup that can be set from 0 to 30 minutes in increments of one minute.
Low Water Safety Control: This device shall automatically shut off power to the heating elements if the water drops below a safe level. This will serve to protect the heating elements from burnout. In addition, the power washer shall prevent further ingress of water in the event of full water condition to prevent the water from overflowing into the shop area.
Operator Maintenance: Filter shall be designed to allow periodic cleaning without removal from the wash cabinet. External mounted grease fittings shall be provided for turntable, wash manifold, and upper door bearings. Solution shall not be discharged outside the unit for treatment or disposal.
Operator Safety: The unit shall shut down automatically upon opening of the loading door. Resetting of a start button will be required once the loading door is closed. An emergency stop button shall be prominently mounted and easily accessible.

Optional Features Included with Each Unit:

0001 **Pump System**
A 15 hp booster pump to feed suction of 40 hp main pump. The booster pump and main wash pump shall be mounted on a common base plate and piped in series.

0002 **Service Pressure Rinse System**
The service pressure rinse system is an automatic rinse cycle using input water pressure as its driving force. This system does not include a pump. Heat exchanger, manifold, and necessary controls are included.

0003 **Automatic Rinse Cycle**
The automatic rinse cycle shall deliver heated fresh water at a minimum of 2 GPM. A hand rinse wand shall be included.

0004 **Automatic Steam Exhaust**
The automatic steam exhaust shall prevent discharge of steam into the shop area or during loading/unloading of the unit.

0005 **Cabinet Insulation**
One inch thick rigid polystyrene panels shall be placed between the metal framework of all vertical surfaces and covered with 16 gauge steel, to act as thermal insulation.

0006 **Sound Insulation**
Sound insulation shall prevent sound pressure from rising above 85dBA at the operator's work station.

0007 **Integral Oil Skimmer**
The integral oil skimmer is intended to carry floating oils out of the cabinet and deposit them into a drum for disposal. Operation of the skimmer shall be automatic.

0008 **Remote Grease Fittings**

0009 **Remote Upper PBM & Door Lube Fittings**
The remote grease fittings comprise externally mounted grease fittings for the turntable, blast manifold, and upper door bearing.

0010 **Centerline Wash/Rinse Power Blast Manifold**
Configuration shall permit blasting across wash area, from top downwards, and bottom upwards. Both the manifold and nozzle assembly shall move reciprocally by pivoting on its vertical axis as the turntable rotates. Movement of manifold *shall not* be synchronized with turntable rotational speed. The solution shall be evenly distributed over the soiled components by the manifold.

0011 **Ten Inch PVC Kit & Flanges**

A kit shall be provided which includes hardware in order to allow the use of PVC as a leak-free steam exhaust stack.

0012 **Clean Machine RetroKit**

The RetroKit includes all "roughed in" plumbing for screw-in installation of the MART Clean Machine at a later date.

0013 **Detergent, Liquid Non-Ionic**

The detergent is identified according to the following two National Stock Numbers: 7930-00-282-9699 and 7930-00-282-9700. One (1) 55 gallon drum shall be provided. The following manufacturers are listed for this item:

C & C Distributing, Inc.
165 West Patterson Avenue
P. O. Box 12366
Ogden, UT

National Industries for the BL
524 Hamburg Turnpike
Wayne, NJ

A detergent "equal to" the above should possess, at a minimum, the following characteristics:

- The detergent shall be a liquid, nonionic surface active agent containing a minimum of 99 percent active ingredient for Type I (water soluble).
- It shall be a liquid at 77^{o}F, and a slight haze is permissible. Chemical content shall be as listed below:

  Water content: not to exceed 0.5%
  Ash content: not to exceed 0.25%
  Nitrogen content: not to exceed 0.1%
  Sulfur content: not to exceed 0.2%
  Phosphorous content: not to exceed 0.1%

- The flash point of the detergent shall be not less than 340°F.
- Cloud point of the detergent shall be not less than 120°F and not more than 160°F.
- No cloudiness, precipitation or sediment shall be formed when the detergent is mixed with anionic and cationic wetting agents.
- Detergent shall be chemically stable to acid and oxidation.
- The pH of a 1 percent solution of the detergent in distilled water at 77^{o}F shall fall within the range of 6.0 to 8.0.
- The detergent shall have a maximum hydroxyl number of 139 mg of potassium hydroxide per gram of sample.

The container shall be durably and legibly labeled as follows:

“DETERGENT
Water Soluble, Nonionic

This product, when dissolved in either fresh water or sea water, will efficiently remove grease, oil, and dirt from a wide variety of surfaces.

WARNING

Do not take internally. Keep out of eyes. Use chemical worker's goggles to prevent material from being splashed into eyes when being mixed and/or applied. In addition to goggles, a plastic face shield may be used to protect the face.

NOTE: The face shield is not to be used in lieu of chemical worker's goggles; it is an extension to the basic eye protection. If swallowed, induce vomiting and call a physician. For eyes, flush with plenty of water and get medical attention. May be irritating to the skin. Use of chemical gloves is recommended.

For most cleaning operations, 1/4 to 1/2 ounce of detergent in a gallon of fresh water or sea water, preferably hot, is sufficient. Very heavy soils may require as much as 1 ounce of product. DO NOT EXCEED RECOMMENDED MIX QUANTITY. IF CLEANING BY HAND - CHEMICAL PROTECTIVE GLOVES SHALL BE USED. SKIN IRRITATION OR OTHER ALLERGIC REACTION MAY OCCUR IF THESE INSTRUCTIONS ARE DISREGARDED. For some applications, the addition of 1 to 2 ounces of an alkali, such as sodium metasilicate or machine dishwashing compound, will improve performance. If alkalis are used, the solution shall be prepared with fresh water. Scrub, mop or wipe the solution into the oily soil and then rinse away the loosened soil with either fresh water or sea water. Cold water rinsing is satisfactory but hot water may be used when it is desired to have steel surfaces dry quickly. Small accessible areas may also be wiped dry if rinsing cannot be done easily.

Closed systems such as compressed air lines, heat exchangers and similar items may be cleaned by recirculating a hot solution of the detergent for 1 to 3 hours followed by rinsing."

The contracting activity shall be provided a material safety data sheet at time of contract award.

COMPETITIVE INITIATIVE
REFRIGERANT RECYCLER
GENERAL DESCRIPTION

P2 Opportunity: Navy air conditioning and refrigeration (AC&R) units generate various used refrigerants such as R-12, R-22, R-500, R-502, and others. Instead of venting to the atmosphere or disposing as hazardous wastes, these used refrigerants can be recycled.

Equipment Description: This unit, attached to an AC&R via a manifold gauge set, removes both refrigerant liquid and vapor from the AC&R. Internally, this unit separates the refrigerant from the lubricating oil and stores each in separate containers.

Implementation Requirements:

- Trained and certified personnel to operate the unit
- Ventilation
- Electrical service

Benefits:

- Recycle refrigerants for reuse at facility.
- Reduce hazardous waste disposal and handling costs.
- Reduce the purchase of new refrigerants.
- Reduce ODS release into the atmosphere.

Other Information: None

Procuring Activity Manager: Michael Viggiano, Code 423 Tel: (805) 982-4895
Naval Facilities Engineering Service Center
Port Hueneme, CA

Technical Activity POC: Charles Yee, Code 423 Tel: (805) 982-3493
Naval Facilities Engineering Service Center
Port Hueneme, CA

Vendor(s): Robinair Model: 17500B

Cost: $3,500

COMPETITIVE INITIATIVE
RINSE WATER EVAPORATOR
GENERAL DESCRIPTION

P2 Opportunity: Reduce the volume of spent process bath and rinse waters, which are either discharged as industrial wastewater or disposed of as hazardous waste.

Equipment Description: This unit is fueled with natural gas; has a 15 to 20 gallon per hour evaporation rate; and contains a water vapor condensation system, automatic fill level controller, and a high- and low-level alarm system. The system is constructed of materials compatible with outside placement under a covered facility.

Implementation Requirements: System is installed in a covered facility near the process tank location. Electrical and plumbing connections are required. Recovery, packaging, and disposal of the remaining concentrate is required. A hazardous waste treatment permit may be required.

Benefits:

- Eliminate or reduce discharge of industrial wastewater.
- Reduce hazardous waste disposal costs.

Other Information: None

Procuring Activity Manager: Michael Viggiano, Code 423 — Tel: (805) 982-4895
Naval Facilities Engineering Service Center
Port Hueneme, CA

Technical Activity POC: Charles Yee, Code 423 — Tel: (805) 982-3493
Naval Facilities Engineering Service Center
Port Hueneme, CA

Vendor(s): LANDA, Inc. — Model: WB-25A

Cost: $31,000

COMPETITIVE INITIATIVE
SELF-CONTAINED RECOVERY/REMOVAL SYSTEM
GENERAL DESCRIPTION

P2 Opportunity: Per Executive Order 12873, DOD has established a 50% solid waste recycling goal for CY 1999. A self-contained recovery/removal system may be used to recover various spills on aircraft carriers for recycling.

Equipment Description: This self-contained recovery/removal system consists of: a 32 horsepower, 3 cylinder, liquid cooled diesel engine; 3,000 psi spray system with trigger gun control; 100 gallon fresh water tank; 1.5 gallon soap tank; 130 gallon recovery tank; and a vacuum system.

Implementation Requirements:

- Self-contained, trailer-mounted system

Benefits:

- Achieve 50% recycling goal.
- Recover various spills for efficient disposal or recycling.
- Realize revenues from sale of recyclables.
- Avoid disposal costs of absorbents.

Other Information: The unit is available in different models depending on the size and recovery volume required.

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Port Hueneme, CA

Technical Activity POC: Debi Price, Code 423 — Tel: (805) 982-2628
Naval Facilities Engineering Service Center
Port Hueneme, CA

Vendor(s): AAR PowerBoss, Inc. — Model: QRE 3000

Cost: TBD

COMPETITIVE INITIATIVE
SHREDDER/CHIPPER UNIT
GENERAL DESCRIPTION

P2 Opportunity:	Reduce the volume of organic solid waste. Waste may be used on-site as mulch fertilizer, thereby eliminating collection and disposal costs.
Equipment Description:	The shredder/chipper is used to mulch organic waste (*e.g.*, tree limbs, branches, etc.). Typical units are gas-powered and may be equipped to handle wet or soggy organic matter.

Implementation Requirements:

- Electric start with key
- Gas-powered

Benefits:

- Reduce organic waste volume.
- Save costs due to reuse of mulch waste as fertilizer.

Other Information:	None	
Procuring Activity Manager:	Jill MacIntyre, 1.1.X.7.1.J.B Naval Air Warfare Center, Aircraft Division Lakehurst, NJ	Tel: (908) 323-1936
Technical Activity POC:	Mike Zitaglio, 4.8.1.6	Tel: (908) 323-4284
Vendor(s):	TBD	Model: TBD
Cost:	$13,500 - $25,000	

COMPETITIVE INITIATIVE
SOLID WASTE RECYCLING TRAILER
GENERAL DESCRIPTION

P2 Opportunity:	Frequently, Navy activities must recycle and transport scrap metal, glass, plastics, cardboard/paper, and wood to the Defense Reutilization and Marketing Office (DRMO) for sale to outside contractors. Solid waste recycling trailers, with up to 10 separate compartments, may be used to efficiently store and transport solid waste materials.
Equipment Description:	These recycling trailers are between 12 to 20 cubic yard solid waste containers, with up to 10 separate compartments suitable for scrap metal, plastics, glass, paper/cardboard, and wood. Each compartment has a top lid made of heavy-duty construction.
Implementation Requirements:	None
Benefits:	• Efficient recycling of solid waste materials at a lower cost.
Other Information:	None
Procuring Activity Manager:	Michael Viggiano, Code 423 Naval Facilities Engineering Service Center Port Hueneme, CA Tel: (805) 982-4895
Technical Activity POC:	Brian Swaidan, Code 423 Naval Facilities Engineering Service Center Port Hueneme, CA Tel: (805) 982-1337
Vendor(s):	ProTainer Model: Pro Trailer “1” Pro Trailer “T” Pro Trailer “II”
Cost:	$5,000 to $11,000

COMPETITIVE INITIATIVE
SOLID WASTE ROLL-OFF UNIT
GENERAL DESCRIPTION

P2 Opportunity: Navy activities frequently transport scrap metal and wood to the Defense Reutilization and Marketing Office (DRMO) for sale. Open-top, roll-off containers may be used to efficiently store and transport scrap materials.

Equipment Description: This unit is a winch/cable-hoist and either a 20 or 40 cubic yard solid waste container suitable for scrap metal or wood The unit is an open-top container made of heavy-duty construction with 1/4" floor and 3/16" sides. The 40 cubic yard unit weighs 8,200 lbs and measures 22' long x 86" wide x 84" high.

Implementation Requirements: None

Benefits:

- Efficient recycling, transport, and segregation of scrap materials at a lower cost.

Other Information: None

Procuring Activity Manager: Mike Viggiano, Code 423 — Tel: (805) 982-4895
Naval Facilities Engineering Service Center
Port Hueneme, CA

Technical Activity POC: Brian Swaidan, Code 423 — Tel: (805) 982-1337
Naval Facilities Engineering Service Center
Port Hueneme, CA

Vendor(s): Glosser — Model: TBD
Capital Industries
Various vendors

Cost: $3,109 (20 cubic yards)
$4,200 (40 cubic yards)

COMPETITIVE INITIATIVE
SOLID WASTE SORTING LINE
GENERAL DESCRIPTION

P2 Opportunity:

Per Executive Order 12873, DOD has established a 50% solid waste recycling goal for CY 1999. Another DOD measure of merit calls for a 50% reduction in solid waste disposal by CY 1999 using a CY 1992 baseline. States such as California and Washington also have solid waste diversion requirements. Activities may find that these requirements cannot be met by source separation alone. A sorting line may be needed whereby the commingled solid waste stream is manually sorted.

Equipment Description:

Major features of the solid waste screening facility include several sorting stations, four conveyor belts, magnetic separator, loading ramp, and electrical controls. Facility includes a heavy-duty horizontal baler.

Implementation Requirements:

- Covered facility required
- Electrical service
- Drainage and foundation

Benefits:

- Meet or exceed 50% recycling goal.
- Meet or exceed 50% solid waste disposal goal.
- Realize increased recycling revenues.

Other Information:

Sort facility will probably have to be funded, designed, and built as a MILCON project.

Procuring Activity Manager:

Michael Viggiano, Code 423 — Tel: (805) 982-4895
Naval Facilities Engineering Service Center
Port Hueneme, CA

Technical Activity POC:

Eugene Wang, Code 423 — Tel: (805) 982-4291
Naval Facilities Engineering Service Center
Port Hueneme, CA

Vendor(s):

Mayfran International — Model: TBD

Cost:

$430,840

COMPETITIVE INITIATIVE
SOLVENT DISTILLATION UNIT
GENERAL DESCRIPTION

P2 Opportunity: Navy activities generate various solvent and chemical wastes such as P-D-680, ethylene glycol, mineral spirits, and other solvents that must be disposed of as hazardous waste. A multipurpose solvent can still be used to distill and recover various solvents for reuse.

Equipment Description: The unit includes a minimum recycling capacity of 55 gallons per day; is capable of recycling solvents with boiling points of up to 500°F under vacuum; has a closed-loop condenser to recapture VOCs; and has disposable inner chamber linings to allow the use of various solvents.

Implementation Requirements:

- Air permitting, as required by locality
- Ventilation
- Electrical service

Benefits:

- Recycle solvents and chemical wastes for reuse at facility.
- Reduce hazardous waste disposal and handling costs.
- Reduce the purchase of solvents and chemicals.

Other Information: None

Procuring Activity Manager: Michael Viggiano, Code 423 — Tel: (805) 982-4895
Naval Facilities Engineering Service Center
Port Hueneme, CA

Technical Activity POC: Charles Yee, Code 423 — Tel: (805) 982-3493
Naval Facilities Engineering Service Center
Port Hueneme, CA

Vendor(s): Finish Thompson Inc. — Model: LS-55IIDV

Cost: $22,000

COMPETITIVE INITIATIVE
TUB GRINDER (DIESEL)
GENERAL DESCRIPTION

P2 Opportunity: Per Executive Order 12873, DOD has established a 50% solid waste recycling goal for CY 1999. Another DOD measure of merit calls for a 50% reduction in solid waste disposal by CY 1999 using a CY 1992 baseline. A tub grinder can be used to help meet these goals by processing wood debris into mulch, compost, and supplemental fuel for base use.

Equipment Description: This trailer-mounted tub grinder features an 8' diameter tub and a 26" long grinding hammer mill. The unit is powered by a 110-hp turbocharged John Deere engine. The grinding cylinder consists of 3/4" hammers, 1/2" cylinder plates, and a 3" cylinder shaft. The unit can be towed by a 3/4-ton pickup truck.

Implementation Requirements:

- Mobile equipment

Benefits:

- Achieve 50% recycling goal.
- Achieve 50% solid waste disposal goal.

Other Information: None

Procuring Activity Manager: Michael Viggiano, Code 423 — Tel: (805) 982-4895
Naval Facilities Engineering Service Center
Port Hueneme, CA

Technical Activity POC: Brian Swaidan, Code 423 — Tel: (805) 982-1337
Naval Facilities Engineering Service Center
Port Hueneme, CA

Vendor(s): Dura Tech — Model: HD-8

Cost: $41,374

COMPETITIVE INITIATIVE
TUB GRINDER (ELECTRIC)
GENERAL DESCRIPTION

P2 Opportunity: Per Executive Order 12873, DOD has established a 50% solid waste recycling goal for CY 1999. Another DOD measure of merit calls for a 50% reduction in solid waste disposal by CY 1999 using a CY 1992 baseline. A tub grinder can be used to help meet these goals by processing wood debris into mulch, compost, and supplemental fuel for base use.

Equipment Description: This electric tub grinder is 45' long, weighs 36,000 lbs, can be skid-mounted or trailer-mounted, and features a 10' diameter tub, 300-hp electric motor, 15 lb grinding hammers, 3/4" thick split screens, and 14' hydraulic lifting conveyor and magnet. A hydraulic coupler is incorporated into the drive system, isolating the engine and clutch assembly from the hammer mill.

Implementation Requirements:

- Concrete pad
- Electricity: 400 VAC, 3 phase

Benefits:

- Achieve 50% recycling goal.
- Achieve 50% solid waste disposal goal.
- Meet air pollution requirements with electrical-driven unit.

Other Information: None

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Vendor(s): Olathe Manufacturing, Inc. — Model: 867TG-EL

Cost: $93,395

COMPETITIVE INITIATIVE
TUB GRINDER (HEAVY-DUTY)
GENERAL DESCRIPTION

P2 Opportunity: Per Executive Order 12873, DOD has established a 50% solid waste recycling goal for CY 1999. Another DOD measure of merit calls for a 50% reduction in solid waste disposal by CY 1999 using a CY 1992 baseline. This heavy-duty grinder can help meet these goals by processing wood debris into mulch; the unit can also handle plaster, paper, concrete, metal, and tire debris.

Equipment Description: This 63,000 lb unit is trailer-mounted and driven by a diesel engine. Approximate size of the unit is 46' long x 8.5' wide. The grinder and associated loader require one operator each.

Implementation Requirements:

- Compacted staging area required for this mobile equipment

Benefits:

- Achieve 50% recycling goal.
- Achieve 50% solid waste disposal goal.
- Extend landfill life.

Other Information: Unit can also be purchased without loader.

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Vendor(s): Rexworks International — Model: Maxigrinder Model 425 and 460G

Cost: $320,000

COMPETITIVE INITIATIVE
VACUUM BLAST MACHINE
GENERAL DESCRIPTION

P2 Opportunity:	Substitute for chemical strippers or mechanical sanding to remove paint from surfaces and boat hulls.	
Equipment Description:	This unit blasts and simultaneously recovers all abrasive material used and dust generated from the operation. The unit may be used with recyclable media such as plastic media. The unit is portable and can be used in an exposed environment. A portable compressor capable of handling the necessary air supply accompanies the unit. All necessary sound suppression is included with the unit.	
Implementation Requirements:	• Air permitting, as required by locality	
Benefits:	• Eliminate use of toxic chemicals (chemical strippers). • Improve depainting efficiency. • Reduce fugitive dust emission.	
Other Information:	None	
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Technical Activity POC:	Charles Yee, Code 423 Naval Facilities Engineering Service Center Port Hueneme, CA	Tel: (805) 982-3493
Vendor(s):	LTC Americas, Inc.	Model: LTC 1060Pn
Cost:	$54,000	

COMPETITIVE INITIATIVE
VACUUM PUMP TRUCK
GENERAL DESCRIPTION

P2 Opportunity:	A vacuum pump truck can be used to pump oil from oil/water separators and transport to a treatment facility; transfer waste oil from satellite holding tanks to treatment facilities; clean bilges of small vessels; and respond to spills.
Equipment Description:	This unit is a heavy-duty, 2000 gallon tank truck fitted with a vane-type vacuum pump capable of both vacuum collection and positive-pressure discharge of waste liquids. Unit is equipped with a floatable skimming weir head and a telescoping rod for cleaning spills. Operation is performed by a single driver/operator.
Implementation Requirements:	• Mobile equipment
Benefits:	• Pumping and transport of waste oil to treatment/reclamation facilities. • Clean up of fuel and certain hazardous materials spills.
Other Information:	None
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Technical Activity POC:	Debi Price, Code 423 Naval Facilities Engineering Service Center Port Hueneme, CA Tel: (805) 982-2628
Vendor(s):	Isometrics — Model: TV200
Cost:	\$80,000 - \$120,000

COMPETITIVE INITIATIVE
VACUUM PUMP TRUCK/CLEANER
GENERAL DESCRIPTION

P2 Opportunity: A vacuum pump truck/cleaner is used for the same functions as a vacuum pump truck, including pumping and transporting waste oil and spill response. In addition, this unit can be used to clean sewers and septic tanks.

Equipment Description: This Type I catch basin cleaner includes a truck-mounted tank and suction pump for collecting waste and a high-pressure, high-velocity jet rodder system for loosening and removing sludge and waste from drainage lines while simultaneously vacuuming the debris from the catch basin or manhole. A floatable skimming weir head is available as standard or optional equipment from most manufacturers.

Implementation Requirements:

- Mobile equipment.

Benefits:

- Clean sewers and septic tanks.
- Pump and transport waste oil to treatment/reclamation facilities.
- Clean up fuel and certain hazardous material spills.

Other Information: None

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Vendor: Isometrics — Model: TBD

Cost: $80,000 to $150,000 (depending on size)
$68,000 (two vacuum pump trucks)
$160,000 (vacuum pump truck cleaner)

COMPETITIVE INITIATIVE
VACUUM SANDING SYSTEM
GENERAL DESCRIPTION

P2 Opportunity: Use portable vacuum sander to remove coatings and to perform other corrosion control operations on composite and metallic aircraft structures while capturing solid waste. Eliminate airborne particulate matter and potential lead dust exposure hazard.

Equipment Description: The Vacuum Sanding System integrates a vacuum cleaner with vacuum assist sanders for eliminating airborne toxins (including lead, chromium, and dust) while removing paint from both metallic and nonmetallic aircraft structures. The system incorporates three-stage filtration comprised of a filter bag, prefilter, and HEPA filter. The system includes one vacuum cleaner, two vacuum assist sanders, two vacuum assist grinders, and one tool caddy.

Implementation Requirements:

Electrical: 115/220 VAC, 60 Hz (vacuum cleaner)
Size: 31" long x 21" wide x 19" high
Compressed Air: 100 psi

Benefits:

- Reduce pollution from current power sanding operations.
- Improve efficiency of operations.
- Improve personnel safety by collecting and containing paint dust particles.
- Reduce labor hours for manual sanding operations.

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Vendor(s):

Clayton Associates, Inc. — Model: 660-DM-1000
Nilfisk of America, Inc. — Model: TBD

Cost: $4,955

COMPETITIVE INITIATIVE
VACUUM SANDING SYSTEM
TECHNICAL SPECIFICATION

The Clayton cleaner/sanding system, Model 660-DM-1000, integrates a vacuum cleaner with vacuum assist sanders for eliminating toxins—including lead, chromium, and dust—from both metallic and nonmetallic aircraft structures during ground support equipment (GSE) sanding and grinding operations. The system shall incorporate a three-stage filtration, to be comprised of a filter bag, prefilter, and HEPA filter. The system shall include one vacuum cleaner, two vacuum assist sanders, two vacuum assist grinders, one package of 6 mil polyliners, one Y adapter, one package of filter bags, two packages of prefilters, and one tool caddy. All accessories shall be compatible with each other. The system shall be in compliance with OSHA/EPA/Navy standards as stated below.

OSHA Standard 1910.1025 and Navy OPNAVINST 5100.23B state: "Where vacuuming methods are selected, the vacuums shall be used and emptied in a manner which minimizes the re-entry of lead dust into the workplace."

OSHA 1910.1205 additionally requires that sanding and grinding operations take place without exceeding the lead permissible exposure limit (PEL) of 50 g/m^3.

0001 **The Clayton Vacuum Cleaner Model ACE-1000**
The unit shall include a manometer, a High Efficiency Particulate Air (HEPA) filter, a prefilter, four extra carbon brushes, locking casters, and a locking filter cabinet latch. The unit shall use a disposable bag system and shall be designed to support two sanders at a time.

<u>Minimum Requirements:</u>

Dimensions: 31" long x 21" wide x 19" high; height with handle is 38".
Power Requirements: Current draw shall be 15A with both motors operating. Voltage shall be 115-220V, 60 Hz.
Compressed Air Requirements: Airflow shall be 220 CFM at vacuum intake and shall be sufficient to simultaneously operate two sanders with 15' extension hoses attached or a single sander using a 50' hose.
Suction Water Lift: Between 60" and 75".
Weight: 126 lbs
Vacuum Capacity: The vacuum cleaner shall have a minimum tank capacity of 8 gallons dry bulk.
Vacuum Fans: Two flow-through type, cooled by air passing through vacuum
Manometer: Registers 0-10 Water Column (WC). The manometer enables the operator to determine when the prefilter and HEPA filter require replacement by directly measuring the air resistance.
Motors: The vacuum shall contain two electronic interference suppressed motors operating at a minimum of 1 HP each, which shall be placed downstream of the HEPA filter.

Filter System: The unit shall incorporate intermediate filter(s) and/or microfilter(s) that shall prevent the passage of any particles larger than 50 microns into the HEPA filter. The unit shall allow for operator inspection of the prefilter and HEPA filter to determine when they need to be changed. The unit shall not incorporate a filter agitator. The unit shall utilize a negative pressure system to enable filters to be changed without the use of protective equipment by the operator, due to a continuous flow of clean air being drawn into the filter compartment.
HEPA Filter Efficiency: The HEPA filter shall have the capability of retaining a minimum of 99.97% of all ultra-fine particles down to and including 0.3 microns.
Operator Safety: Locking casters shall be provided to prevent the unit from moving during operation. The HEPA filter shall be positioned upstream from the motor to ensure that operators never handle a contaminated motor.

0002 **The Clayton Model 660-MK-2S Orbital Sander**
Should also include Clayton Model 661-6BPS stick-on backing plate, Clayton Model 661-6P pierce plate, Clayton Model 661-AVHMK15 hose, and a top-mounted trigger.

The unit shall be a positive drive, random orbit vacuum assist sander with 6" disc size and be designed to remove at least 99% of airborne particles. The unit shall be used to provide smooth finishes on paint, metal, wood, plastic, and composite aircraft structures. The unit shall have single handle operation and a combination vacuum hose and air line for operator convenience.

Minimum Requirements:

Dimensions: Not to exceed 15" long x 16" wide x 6" high
Weight: Not to exceed 4 lbs
Sanding Disc Size: 6" diameter
Sanding Pads: The vacuum assist sander shall be designed to be used with 6" stick-on backup pads of two types—including precoated back plates and uncoated back plates. Precoated stick-on back plates shall be included.
Compressed Air Requirement: Air consumption minimum 10 CFM at 75 to 90 psi
Air Motor: Minimum 11000 rpm air motor with built-in speed control
Pierce Plate: The unit shall include a pierce plate for making ventilation holes in the sandpaper and a 15' vacuum hose with attached airline for connections to the vacuum cleaner. The size of the unit shall not exceed 6" x 6" with a 3/4" flange. Weight shall be approximately 6 ounces.
Hoses: The vacuum hose/air line shall be of 1-1/4" diameter and 15' in length, given the specified CFM. The compressed air hose shall have a 3/8" inner diameter. Weight shall not exceed 7 lbs. The vacuum hose shall be smooth-lined and steel reinforced—with ball-joint connections and swivel cuffs provided. Hose connections shall be secured firmly to prevent pulling apart during the sanding operation

0003 **The Clayton Model 660-M1500S Rotary Grinder**
Should also include Clayton Model 661-8BPS stick-on backing plate, Clayton Model 661-8P pierce plate, and Clayton Model 661-AVH1515 hose assembly.

The unit shall be a high-torque, low-speed rotary action vacuum assist type grinder designed to remove at least 99% of airborne particles. The unit shall be specifically designed for the sanding of lead-based paints.

Minimum Requirements:

Dimensions: Not to exceed 15" long x 8" wide x 6" high
Weight: Not to exceed 7 lbs
Sanding Disc Size: 8" diameter rotary backing pads. A precoated stick-on back plate shall be included.
Compressed Air Requirement: Unit shall operate on a minimum of 85 psi
Air Motor: Adjustable from 1500 to 3000 rpm
Pierce Plate: The unit shall also include a pierce plate for making ventilation holes in the sandpaper. Dimensions shall not exceed 8" x 8" with a 1" flange. Weight shall be approximately 13 ounces.
Hoses: A 15' vacuum hose with attached airline shall be provided. The 1-1/4" diameter hose shall be smooth-lined and steel-reinforced—with ball joint connections and swivel cuffs provided. The compressed air hose shall have a 3/8" inner diameter. The weight of the hose shall not exceed 7 lbs. Hose connections shall be secured firmly to prevent pulling apart during the sanding operation.

0004 **The Clayton Model 600-114 Polyliner Bag**
This item is a 6 mil OSHA standard plastic disposal bag with a 10-gallon capacity. The dimensions of one flat bag shall measure approximately 39" x 33".

0005 **The Clayton Model 600-1157 Y Adapter**
This item is a steel weldment designed to be compatible with the 1-1/4" diameter airhoses and sanders described above. Dimensions shall not exceed 8" long x 7" wide x 2" high. The weight shall be approximately 2 lbs. This item is provided to allow for dual sanding capability.

0006 **The Clayton Model 600-313A Filter Bags**
These items provide 95% efficiency at 0.5 micron. These disposable non-woven fabric filter bags shall comprise the first stage of the three-stage filtration system in the vacuum cleaner. The size of one flat bag shall be approximately 22" x 9". Warning labels shall be provided on the filter bags for installation and disposal.

0007 **The Clayton Model 600-115 Prefilter**
This item provides 95% efficiency at 0.3 micron. The prefilter shall comprise stage two of the three-stage filtration system and shall be designed to prevent the HEPA filter from clogging. The prefilter shall measure approximately 12" long x 12" wide x 2" high.

0008 **The Clayton Model 650-185 Tool Caddy**

This item houses the entire vacuum sanding system. The caddy contains a flat surface for stowing the sander, grinder, and hoses. Dimensions of the tool caddy shall not exceed 27" long x 22" wide x 16" high. The weight of the tool caddy shall not exceed 31 lbs. Nameplates are to be constructed of metal and permanently attached to each tool caddy. Nameplates shall contain, as a minimum, the following:

a. Item Nomenclature
b. Item Part Number
c. National Stock Number (if any)
d. Type Equipment Code
e. Contract Number
f. Manufacturer
g. Manufacturer's FSCM
h. Assembly Part Numbers
i. Quantities of the Assembly's Components.

COMPETITIVE INITIATIVE
VERTICAL BALER
GENERAL DESCRIPTION

P2 Opportunity:	Per Executive Order 12873, DOD has established a 50% solid waste recycling goal for CY 1999. A vertical baler is used to compact recyclables for transport to market.
Equipment Description:	The baler compacts cardboard and paper cartons into 1,200 lb bales measuring 30" x 60" x 45". A 10 hp electric motor powers the baler's hydraulic system, providing 30 tons of compaction force during 1 minute compaction cycles. The baler can be operated outside in temperate climates.

Implementation Requirements:

- Dimensions: 7' wide x 6' deep, 7,000 lb
- Foundation for the footprint
- 12' vertical clearance
- Electrical: 220 VAC, 3 phase
- Single operator
- The baler may be located outside in temperate climates

Benefits:

- Achieve 50% recycling goal.
- Compact recyclables for efficient transport to market.
- Realize revenues from sale of recyclables.
- Avoid disposal costs.

Other Information: None

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Vendor(s):	EPCO Manufacturing Corporation	Model: TBD
	International Baler Corporation	Model: TBD
	Load King Manufacturing Company, Inc.	Model: TBD
	Marathon Equipment Company	Model: TBD
	Piqua Waste Equipment	Model: TBD
Cost:	$9,000+	

COMPETITIVE INITIATIVE
X-RAY FILM PROCESSOR
GENERAL DESCRIPTION

P2 Opportunity: Current X-ray developers are large and used infrequently. Developer and fixer solutions are wasted when only small quantities of film are developed at one time. Activities require smaller developers that use proportional quantities of chemicals.

Equipment Description: The X-ray film processor can develop film with a minimum length of 4" and a maximum width of 17". The unit includes developer, fixer, and wash tanks with a capacity of 1.8 gallons each. Replenisher tanks for the fixer and developer have capacities of 8 gallons. The developer operates off a 220V source and uses infrared drying. The unit also includes a water filter and cartridge and drain collection. The developer can be mounted on a base.

Implementation Requirements:

- Plumbing hook-ups
- Electrical: 220 V

Benefits:

- Reduce chemical usage and waste.
- Reduce energy consumption.

Other Information: None

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Vendor(s):	AGFA	Model: STRUCTURIX
Cost:	$9,907	